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Review

# Economic Efficiency or Gender Equality: Conceptualizing an Equitable “Social Framing” for Economic Evaluations to Support Gender Equality in Disaster Risk- and Environmental-Management Decision-Making

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**Abstract:** It is unlikely that cost–benefit approaches will be effective in identifying investments that support gender equality without a relevant “social framing”. Criteria for a “social framing” are lacking, yet cost–benefit approaches often guide investment decisions for disaster risk and environmental management. Mainstream approaches typically do a poor job identifying and characterizing costs and benefits, and often fail to address distributive concerns (i.e., how costs and benefits may be distributed throughout society, to whom, etc.). Gender-blind investments may project responsibility for equality “problems” onto one sex, potentially augmenting gender inequalities and disaster risk. This article examines evidence from the gender, disaster, and development literature to identify distributive concerns and criteria for an equitable “social framing” for economic evaluations. Primary distributive concerns identified regard assumptions of women’s homogeneity, agency, “active” participation, and the influence of customary practice and displacement on disaster vulnerability. The need for a “gender-responsive” “social framing” that considers the needs of men and women in relation to one another is evident. Second, cost–benefit studies focused on gender equality concerns are reviewed and the “social framing” is critiqued. Results show most studies are not “gender-responsive”. Women’s health concerns, often exacerbated by disasters, are sidelined by assumptions regarding distributive concerns and reductive outcome measures.

**Keywords:** cost–benefit analysis; cost effectiveness analysis; gender equality; disasters; environment; ethics; gender mainstreaming; disaggregated data

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## 1. Introduction

While biological (sex) differences are natural, the meaning ascribed to them is not. Ideas about masculinity and femininity are socially constructed [1], often to the detriment of gender equality. Globally, females are less likely to have adequate nutrition, access to and control over sexual and reproductive health resources, land and property rights, equal political representation, education, equal pay, they bear a greater proportion of childcare responsibilities and unpaid work, and they are more often victims of domestic violence, compared to males [2,3]. Further, gender inequalities are often heightened during times of crisis [4,5]. At the same time, not all women are more vulnerable, or less empowered, to cope with and recover from shocks and stressors compared to men, or in comparison to other women. Gender studies examine relationships between the sexes, seeking to understand why and how these relationships are produced, reproduced, and how they can be changed [1]. A “gender-responsive” approach to disaster risk and environmental management can therefore help to understand what factors contribute and detract from people’s empowerment, how these factors are interrelated, and how to overcome gender inequalities.

It is unlikely that economic investments or interventions will effectively address gender inequalities unless they: (i) characterize distributive concerns (i.e., how costs and benefits are distributed within a society, to whom, etc.), and (ii) adopt a “gender-responsive” approach. It is widely acknowledged that economic analyses of costs and benefits should be paired with social analyses to understand the potential impacts of activities, however there is no standard guidance for this pairing [6–10]. Nevertheless, cost–benefit approaches often play a critical role in policy and decision-making [10]. Systematic discussion on the “social framing”, or substance of an equity analysis for cost–benefit approaches for different sectors is limited [9], including for gender equality. This article asks the following questions: (1) When and how does the “social framing” go wrong? (2) How can it be done better? Fundamental principles identified from 40+ years of gender scholarship at the nexus of gender, development, and disasters, are used to identify primary distributive concerns for cost–benefit assessments, and to recommend a more equitable “social framing” for economic evaluations. Key gender studies are used to illustrate the relevance of these principles for disaster risk- and environmental-management. A selection of economic case studies addressing gender equality concerns, which illustrates a range of traditional and contemporary cost–benefit approaches, is then reviewed. The “social framing” of these studies is critiqued to better understand how (and if) these studies are informed by gender theory, or other sources, and to evaluate potential outcomes.

Results recommend that the majority of cost–benefit studies reviewed here, with some notable exceptions, are not “gender-responsive”, or well informed by gender theory. The ability of these studies to determine causality, and thus to evaluate the impact of activities on gender equality, should be strongly scrutinized. Key distributive concerns identified in the gender, disaster, and development literature that should inform the “social framing” for economic evaluations pertain to assumptions made regarding people’s homogeneity, agency, customary practice, “active” participation, and the impacts of displacement on (disaster) vulnerability. These concerns are often poorly characterized in “social framings” of traditional cost–benefit evaluations, which can mask the heterogeneity of costs and benefits of activities to different groups of people, and potentially augment gender inequalities and disaster risk. “Gender” is frequently equated to “women”, who are assumed to be a homogenous group. The impact of activities on gender relations is typically ignored. This poses gender equality “problems” as “women’s issues”, leading to feminization of responsibility. This may also lead to exploitation of women, or women’s groups, by engaging them in activities without consideration of the sacrifices made by them to participate in these activities, and without questioning what alternative activities might be of greater benefit. Assessments are most frequently made from the provider perspective, which masks opportunity costs [11], with some exceptions. Furthermore, the robustness of outcome measures should be strongly questioned, as women’s wellbeing is frequently reduced to income and expenditures. Women’s experiences, structural barriers, and less tangible or easily monetized concerns, are overlooked. This is especially worrisome for studies examining women’s health issues, as it ignores questions of women’s access to resources, and agency to make decisions about their own bodies. Progress is also evident, as modifications to traditional cost–benefit approaches, or other contemporary approaches, provide a more comprehensive picture of the costs and benefits of activities; thus, these methods are better suited to support more gender equitable investment decisions. Modifications to cost–benefit analysis (CBA), as well as other contemporary cost-benefit approaches, demonstrate greater potential to address distributive concerns, and over a longer time frame. Ethnographic assessments of economic activities or interventions identify structural barriers, and provide a more comprehensive understanding of the access to, and outcomes of, activities for different groups of people. Studies reviewed examining “gender-responsive” activities, while in the minority, tend to also be better informed regarding distributive concerns. These activities are therefore more likely to be successful in alleviating gender inequalities over the longer-term, as they address power imbalances between the sexes. Results of this review provide guidance on a more equitable “social framing” for economic investments by characterizing key distributive concerns, and emphasizing the merit of a “gender-responsive” approach. Results of this review can be used

by disaster risk- and environmental-management decision-makers to better identify, and evaluate, investment opportunities that can support gender equality. Collection of disaggregated data by factors shown to influence vulnerability (i.e., sex, age, disability, ethnicity, etc.), coupled with a “gender-responsive” analysis, can further strengthen the evidence base for disaster risk and environmental management, and better inform more gender equitable investment decisions.

## 2. Background

### 2.1. Aims and Primary Limitations of Mainstream Cost–Benefit Approaches

Economic evaluations aim to provide an overall indicator or summary of the economic benefit of an activity or program, contrasted against alternate pathways or actions. The costs of constructing levees, for example, measured against averted losses from flood damage that could be provided by those levees. This becomes more difficult, however, when human behavior is involved, or when activities influence people’s basic rights and freedoms. Given that many women and girls are more exposed to disaster risk in comparison to men and boys, how does one decide who to help, and how? How does one choose which inequality to address, and measure the associated costs and benefits? These are difficult questions, and it is unlikely that they will ever be fully answered. However, it is certainly possible to provide a more equitable “social framing” for economic assessments that more robustly characterizes distributive concerns of activities, and better scrutinizes the implications of gender on disaster vulnerability.

CBA is a class of distinct but related approaches that impose certain restrictions on evaluation rules and permissive procedures [7] (p.935). Cost-Effectiveness Analysis (CEA) and Cost-Utility Analysis (CUA) are similar approaches common to the public health field, which also require a relevant “social framing” to inform on the equity of activity outcomes. Amartya Sen [7] identifies three central critiques of mainstream CBA relating to what he terms “structure”, “evaluative indifference”, and “market-centered valuation”. With reference to structure, CBA and related approaches “assume completeness” or “full knowledge” of the potential outcomes and costs and benefits of an activity. That is, CBA are assumed to be explicit evaluations, which is a difficult condition to meet when considering human behavior. Evaluative indifference refers to the fact that actions, motives, and rights are frequently neglected in mainstream CBA approaches. For example, promoting girls’ education in regions where girls’ are underrepresented is intuitively viewed as positive, as most agree females should have equal access to education as males. However, this may come at a cost, at least partially, to the girls’ themselves. If, for example, girls’ primary needs are in sexual and reproductive health (SRH), or protection from gender based violence (GBV), then prioritizing an investment in girls’ education may come at the cost of their overall health. Even if education serves to partially mitigate the impacts of GBV in the short-term, for example, by reducing their risk of rape while at school. Benefits emerge to society as more educated girls’ are more easily employable, earn more income, and can then contribute more in expenditures. Girls’ experiencing GBV will likely suffer emotional trauma, earn less, and they may suffer other adverse health outcomes such as sexually transmitted diseases, unwanted pregnancies, or die from GBV related injuries. While the girls might benefit from the education and employment, they might have benefitted more from improvements in SRH, GBV prevention, or “gender-responsive” programming that improves girls’ access to education, which, at the same time, address negative social norms that perpetuate discrimination against girls.

Investment decisions of this nature are frequently influenced by the outcome of CBA or similar cost-benefit assessments. CBA are still widely encouraged at the national and international level to inform policy decisions for a wide range of activities from transportation planning [12] to priority setting for sustainable development goals. CBA features prominently in the Copenhagen Consensus recommendations for post-2015 sustainable development goals regarding gender equality, for example [3]. When CBA are conducted from a variety of perspectives, that is, service providers, clients, the general public, or environmental, motives may be more evident. CBA and related

approaches are also typically market-centered valuations, while there are modifications, but typically, costs and benefits must be monetized. In the absence of a market for a good, the benefits of an activity may be largely ignored. Smith [13], for example, illustrates how market regulations in G20 countries discourage breastfeeding, for which there is no market, and encourage formula feeding, for which there is a market. Despite the known benefits to breastfed infant's cognitive and immune development, for food security, and for the mother's health, formula feeding is promoted. Benefits of breastfeeding are not examined from breastfeeding mother's perspectives, however, and so often go unnoticed in policy [13]. It is necessary, therefore, to question the "social framing", and the potential motive behind the "social framing", of the CBA if these assessments are to positively influence gender equality.

Generally speaking, traditional economic evaluations assume homogeneity of costs and benefits of activities [7]. CEA, for instance, may assume equal benefits for men and women, young and old, as that degree of specificity is not typically incorporated [14] (p.6). However, more recent models attempt to address distributional effects (i.e., distributive concerns). The Distributional CEA framework (DCEA) [15], for example, models potential impacts of activities using sex disaggregated data and social welfare indices. Alternative approaches, notably Amartya Sen's capabilities approach (see [2] for gender equality discussion), or the use of multi-criteria analysis [16], are other options for addressing social equity challenges. The focus of this article, however, is on more mainstream cost-benefit approaches, as they are still widely promoted and used to inform policy decisions. Additionally, because a more equitable "social framing" is equally relevant and complementary to other economic evaluation approaches.

## 2.2. Characterizing Distributive Concerns

CBA, and similar techniques, are not well suited as standalone measures to support gender equality decisions. CBA does not generate data on distributional impacts of project alternatives, rather, it reports on economic efficiency, and thus it cannot be used to support decision makers concerned with equality in selecting projects that generate a fair distribution of benefits [9] (p.969). While distributional weights are intended to account for distributional impacts or concerns within CBA, they only change the "score" of a given activity or project, and do not provide information on the distributive impacts of each activity alternative. Further, they are only relevant if decision makers consider equalization as the guiding principle and seek to reduce inequalities [9] (pp.968–969). In practice, distributional weights are rarely used [17,18]. There are also advantages to a cost-benefit approach, as identifying the most cost-efficient option can free resources to address other important problems. However, prioritizing investments in support of gender equality requires an understanding of distributive concerns, and "social framing" for the analysis to address the root causes of gender inequality. This section highlights key studies from the gender, disasters, and development literature that can be used as a foundation to identify distributive concerns, and other important lessons regarding good practice for implementation.

### 2.2.1. Why Utilize the Gender, Disaster, and Development Literature?

Gender inequalities are often heightened during times of crisis [4,5]. Traditional gender roles and responsibilities are frequently reinforced [19,20] and women suffer longer-term, less tangible (and less easily monetized) impacts of disasters such as increased violence, increased burden in childcare responsibilities and unpaid care work, and a decline in sexual and reproductive health [8]. Recognition of the gendered nature of disaster impacts, coupled with the extensive cost of these events, has been an influential factor motivating gender as a field of study [1,21]. More than forty years of scholarship at the nexus of gender, development, and disasters provides an evidence base that spans the development continuum, better enabling an interrogation of what facets of women's empowerment are related to economic disparities. Furthermore, gender studies frequently adopt a critical feminist or sociological approach, which questions the root causes of gender inequality, characterizes gender relations, and draws distinctions regarding disaster impacts among and between different groups of people. Thus,

this body of scholarship provides an ideal evidence base for characterizing distributive concerns, and for informing the “social framing” of economic assessments.

Fundamental principles and practical lessons from the gender, disaster, and development literature used to identify the primary areas for distributive concerns (i.e., heterogeneity and diversity, agency, formal and informal rights, displacement, and “active” representation) are summarized in Table 1. Additionally, evidence on disaster impacts, disaster response, and lessons identified for planning, which are useful to help prioritize women’s empowerment concerns, are highlighted. The gender evidence base recommends that women (and men) should not be considered a homogenous group when assessing the impacts of development activities, as factors such as age, sex, race, and ethnicity intersect to influence a person’s vulnerability, which in turn influences the overall benefits of activities. Nor should women necessarily be considered more vulnerable than men. Full characterization of costs and benefits requires an understanding of vulnerability in a given population, and characterization of structural barriers. Gender-blind investments can promote gender inequalities, while potentially providing economic benefits to service-providers, funders, etc., so it is necessary to question the perspective from which benefits are assessed. Gender-blind investments may not address harmful social norms, or critically assess whether actions such as including more women in traditionally male-led groups actually results in fair representation. Incorporating outcome measures in cost–benefit assessments that reflect women’s experiences can better reflect women’s agency, as well as customary practice, and thus be more representative of the impact of activities on people’s rights and freedoms.

### 2.2.2. Key Illustrations from Gender-Responsive Studies

Case studies in the following section illustrate the relevance of the practical lessons identified in Table 1 for disaster risk and environmental management in both developing and developed contexts.

**Table 1.** Fundamental principles and practical lessons from gender theory and scholarship to inform the “social framing” of cost–benefit assessments. Studies recommend ignoring these factors can result in activities that negatively impact women’s rights.

<b>Heterogeneity and diversity</b>
<ul style="list-style-type: none"> <li>• “Gender” should not be equated with “women” only, and “women” should not be considered a homogenous group, as intersecting factors (i.e., class, caste, ethnicity, race) influence women’s disaster vulnerability [22,23]</li> <li>• Understanding the benefits and negative consequences of new economic activities requires characterization of the social and economic relations between groups and with institutions [24,25]</li> </ul>
<b>Agency</b>
<ul style="list-style-type: none"> <li>• Policies and activities need to account for women’s control over project benefits [26] and projects should not consider men/women have equal share of household resources [27,28]</li> </ul>
<b>Formal and informal rights</b>
<ul style="list-style-type: none"> <li>• Women’s property rights in natural resources need to be determined from the outset of a project, and monitored throughout [26,29]. Formal laws and regulations intersect with cultural and social norms to influence people’s behavior, which is well evidenced during disasters [19,20] and sustainable development [26]</li> </ul>
<b>Displacement</b>
<ul style="list-style-type: none"> <li>• Displacement and housing tenure are factors influencing gender based violence during and after disasters and crises across development contexts [30–34]</li> </ul>

Table 1. Cont.

<b>Inclusion and representation</b>
<ul style="list-style-type: none"> <li>• Inclusion of women without enabling “active” representation can reinforce the status quo [35] rather than advance gender equality, women should be given voice in decision-making coming into an environment where they have had little to no say in making rules/regulations [21,35]</li> </ul>
<b>Disaster impacts</b>
<ul style="list-style-type: none"> <li>• Globally, women often suffer greater “secondary” disaster impacts compared to men including an increase in violence, increased burden in unpaid care work, decline in sexual and reproductive health [5]</li> </ul>
<b>Disaster response</b>
<ul style="list-style-type: none"> <li>• Gendered differences in disasters are evident throughout all phases of the disaster management cycle [4,36]</li> <li>• Women and men have different physiological needs and harmful social norms may prevent treatment. These considerations should be accounted for in healthcare/emergency medical treatment, and addressing these needs can provide a more efficient and equitable response [37]</li> </ul>
<b>Technical and study design</b>
<ul style="list-style-type: none"> <li>• A focus on women/girls only in project activities can result in feminization of responsibility [1], and often leads to exploitation of women, or women’s groups, as a source of untapped labor, often free, while excluding them from other activities [21]</li> <li>• The collection of data disaggregated by sex, age, and (dis)ability is needed to better understand disaster impacts and recovery to reduce the vulnerability of both males and females [38]</li> <li>• Gendered analysis, which examines the power relationships between men, women and gender minorities is needed to understand causal mechanisms which underpin gender equality issues [1,5] such as gender based violence, inequity in labor (i.e., unpaid care work and gendered division of labor) [39] and women’s health disparities, including control over women’s bodies</li> </ul>

### 2.2.3. Heterogeneity and Diversity

In agreement with reviews of disaster impacts that show gender differences throughout all phases of the disaster lifecycle [36], the World Health Organization [4] has found patterns of gender difference at all levels of the disaster process (i.e., preparedness, response, physical/psychological impact, risk perception, risk exposure, recovery and reconstruction), yet disaster research in planning and aid remains largely gender blind, assuming the population is homogeneous [37]. Gender scholarship from development and disasters, however, evidences how assumptions regarding homogeneity of groups of people, or failing to address other distributive concerns of development activities, can act to reinforce gender inequalities. Further, scholars and practitioners have recommended practical steps for data collection, analysis and identified lessons for structuring activities to overcome these pitfalls.

### 2.2.4. Gender Based Violence (GBV)

Gender studies from both lower- and higher-income countries have evidenced differential impacts of disasters and other crises on GBV for women and men, families, and (geographic) communities. Wilson, Philips and Neal [40], examining case studies of GBV during disasters in the USA, showed that perceptions of GBV pre-event significantly influenced findings post-event—communities that viewed GBV as a serious problem pre-event were better prepared and more cognizant of GBV post-event. No new post-disaster groups or organizations arose to assist victims of domestic violence. If violence was addressed, it was because awareness and perceptions of violence existed before the disaster and resources were in place to respond [40].

Following Hurricane Katrina in 2006 in the USA, gender studies showed distinctive patterns in the type, timing, and victims of GBV. Evidence recommends that the severity of the violence increased; rapes were “more brutal, often involving multiple offenders” and increased severity of intimate partner violence (IPV) was also reported [32,41]. Displaced women in “temporary” housing in Louisiana reported rape at triple the rate expected on a population basis since their displacement [42]. In a

similar study on displaced women, Anastario, Larrance and Lawry [33] found that nearly one in five women had been subject to sexual violence after the hurricane, among them, those most subject to post-disaster abuse were women of color. In a study of parenting post-Hurricane Katrina, Peek and Fothergill [43] found that, while women of all races and class backgrounds were primarily responsible for childcare, low-income African American women were more likely to be displaced, and to have fewer resources and agency in decision-making.

The high prevalence of violence, changing nature of violence throughout the crisis event, and the multiple “levels” of violence (i.e., between partners, within families) evidenced by recent disaster studies in developed contexts, draws many similarities to complex humanitarian emergencies and crises in less developed countries. Adam et al. [34] reported a similar ratio of one in five females having experienced sexual violence in refugee camps. Wirtz et al. [44] demonstrate that GBV persists across the span of the refugee experience however there is a transition in the range of perpetrators and types of GBV experienced. Lower-income women and minorities (including gender minorities) may be at greater risk to GBV, but economic disparities alone do not provide a comprehensive picture of GBV risk. These results further evidence the need to consider violence, and its impacts, as heterogeneous and multi-faceted. Property ownership, for example, is considered a protective factor against GBV in less developed contexts, but not for developed ones. However, displacement (from one’s housing) and housing tenure both emerge as risk factors for women experiencing GBV across the development continuum. Distributive concerns for GBV then should engage social, environmental, and legal factors.

#### 2.2.5. Sexual and Reproductive Health (SRH)

GBV posed challenges to survivor’s mental and physical health following Hurricane Katrina and other disasters in the USA (see Enarson [30] for detailed discussion), but GBV is not the only concern for sexual and reproductive health (SRH). Inadequate access to obstetrics and gynecological OB/GYN healthcare, female physicians, and to reproductive control measures, places women at greater risk of infections, premature births, malnutrition, unwanted pregnancies, and pregnancy losses during disasters [4]—vulnerabilities that were evidenced following Hurricane Katrina [37,45], but that receive little attention. Adopting a “gender-responsive” or “gender-aware” healthcare approach such as the one presented as a checklist by Richter and Flowers [37] can enable more equitable and efficient care to both sexes.

#### 2.2.6. Women’s Employment

Across the development continuum it is well established that women are often at a disadvantage in the labor force—despite the fact that women occupy 50% of the global labor force participation compared to 77% of men, analysis of total hours worked in time-use surveys (in a sample representing 69% of the global adult population), shows women contribute 52% of global work compared to men’s 48% [46]. Despite carrying more of the work burden, women face greater disadvantage in both paid and unpaid work.

Recent studies recommend that women’s unpaid care work increases during disasters. Drolet et al. [19] reported women’s workload effectively doubled following 2010–2011 floods in Pakistan, as women took on roles in reconstruction and agriculture considered “men’s work” in addition to their traditional roles as carers, whereas men’s workload remained unchanged. Men suffered employment loss and damaged livelihoods. Saito [20] found that, despite gender issues increasingly being recognized in policy, traditional gender norms, which burden women with greater care responsibilities, were reinforced following recent earthquakes in Japan. These studies recommend the need for development and disaster programming to look beyond policy and legal frameworks and consider informal attitudes and cultural practice (customary practice) to address gender equality issues [19].

#### 2.2.7. “Active” Participation and Representation

Studies from both development and disasters show that simply adding more women into groups, councils, or political positions does not ensure fair or “active” representation. However, inclusion is still favored over exclusion. Utilizing forestry case studies in Sweden and India, Arora-Jonsson [35] shows that the inclusion of women in forestry projects is “double-edged” and can be a way of maintaining



the status quo, rather than questioning gender inequalities. Women who were included in these projects were expected to abide by rules and laws over which they had little say, participating in their own groups was viewed as a threat by traditional, male-led forestry organizations [35] (p.749). It should not be assumed that the entry of women into existing institutions, or similarly, that channeling funds to women's groups for development or disaster planning initiatives will change unequal gender relations, as it may have the opposite effect. Women's actual ability to participate in groups should be considered.

Nor should it be assumed that women would participate in the same way as men, as is demonstrated by a recent case study of the Alianza de Mujeres Activas (AMA; Alliance of Active Women) [19]. The AMA organized following the devastating impacts of multiple hurricanes in Volusia County, Florida in 2004–2005. Recognizing that the migrant farm workers in the community were not being served by formal government disaster response agencies, the AMA took action. Needs arose partly from Limited English Proficiency (LEP) of the migrant workers, but also from historically weak relationships between the LEP community and local government. The AMA provided food, supplies, outreach, and assistance to the LEP community [19]. The AMA later formed a bilingual volunteer community emergency response team, El Grupo Comunitario de Respuesta a Desastres (Community Disaster Response Group), which now represents a broader mix of community members (e.g., both men and women, bilingual people, people with little English, young and old) who are engaged in identifying and planning for the disaster needs of LEP populations [19] (p.444). This recommends that traditional concepts of "participation" and "representation" need to be questioned more rigorously before cost and benefit assessments can be considered "fully complete".

### 3. Methods

A general review of the literature using the search terms cost, cost–benefit analysis, cost effectiveness, cost effectiveness analysis, gender, economic\*, hazard\*, and disaster\* was conducted on Web of Science and Google Scholar. To be included, studies needed to have a focus on gender equality, or issues commonly identified as gender equality concerns (i.e., sexual and reproductive health, gender based violence, women's empowerment), report on economic evaluations of activities or interventions, and provide a social analysis or justification for the economic evaluation. A snowball approach was used to identify additional studies from bibliographies of studies meeting the screening criteria. Systematic reviews were not excluded if they provided clear criteria for the methods utilized for assessing the social and methodological robustness of studies reviewed.

### 4. Results

Results show that conceptual and methodological assumptions are made in many of the studies examined regarding homogeneity of costs and benefits; "gender" is often equated to "women", who are assumed to be a homogenous group. Opportunity costs to women are assumed equal, social and institutional barriers are frequently ignored, as are women's/girl's ability and agency to utilize resources. There is no apparent consensus on appropriate outcome measures for sexual and reproductive health (SRH), gender based violence (GBV), or other gender equality concerns.

Table 2 shows results of studies applying or assessing CBA or CEA. Gender equality themes addressed pertain to SRH, GBV, and evaluating policy effectiveness. Studies spanned multiple disciplinary domains such as public health, disaster sciences, and economics, and both developing and developed geographies. Girl's/women's experiences, gender relationships, and control of girl's/women's bodies, longer-term impacts of violence and costs to victims, burden of unpaid care work and quality of employment, are ignored in the majority of studies reviewed. A minority of studies reviewed examine men's/women's or boy's/girl's needs in relation to one another (i.e., are "gender-responsive") [47,48]. A minority of studies reviewed also present methodological innovations that improve upon traditional economic evaluation approaches [49].

**Table 2.** Cost–benefit analysis (CBA) and cost effectiveness analyses (CEA) results.

Reference	Study Aims, Key Findings and Economic Evaluation Description
Bandiera, et al. [50]	<p><u>Aims and findings:</u> Reports CBA for a Randomized Control Trial (RCT) conducted in Africa examining the impacts of vocational and life skills training program for adolescent girls. Program is led by female mentor, provides “safe-space” and is held after school. Findings recommend the “program increases labor force participation and reduces childbearing, marriage and unprotected sex in participants” [51] (ibid: 44).</p> <p><u>Method:</u> CBA <u>Perspective:</u> provider</p> <p><u>What is cost:</u> initial program investment of setting up a program office, training of program staff and program manual development; infrastructure costs; variable costs of the program.</p> <p><u>Categories:</u> SRH; GBV; economic empowerment.</p>
Tate et al. [49]	<p><u>Aims and findings:</u> Investigates post-flood property acquisition from the perspectives of cost effectiveness and social equity. (modified) CBA is conducted at the parcel scale and social equity is assessed with a social vulnerability index tailored to flood recovery in Cedar Rapids, Iowa. Results recommend that property acquisitions are cost-effective based on the avoidance of future losses, further that socially vulnerable neighborhoods were prioritized [49] (p.2055).</p> <p><u>Method:</u> CBA <u>Perspective:</u> societal</p> <p><u>What is cost:</u> benefits are determined in terms of avoided losses (i.e., expected reduction in damage (average annualized losses) that would occur given the distribution of stream flows); benefits are then compared to expenditures for the buyout program. HAZUS-MH flood model used to estimate physical damage and economic loss for each parcel.</p> <p><u>Categories:</u> policy effectiveness.</p>
Perezniето et al. [47]	<p><u>Aims and findings:</u> Estimates the annual global costs of different forms of violence against children. Results recommend that annual costs of child labor are approximately USD 97 Billion, those associated with children’s association with armed forces or groups reach up to USD 144 Million annually. Despite strong evidence for cost effectiveness of prevention measures, current levels of government spending on preventive and responsive actions in relation to violence against children remain very low.</p> <p><u>Method:</u> (other) CBA <u>Perspective:</u> provider, societal</p> <p><u>What is cost:</u> costs of implementing policies and programs to address the issue; government and donor spending on violence prevention; other direct costs (medical treatment, income loss from disruption to employment); Indirect costs (i.e., to victims and communities) based on a productivity approach.</p> <p><u>Categories:</u> GBV; children.</p>
Clots-Figueras [3]	<p><u>Aims and findings:</u> Reviews recent economic evaluations of activities/interventions intended to address gender equality concerns. Makes recommendations regarding benefits/costs of post-2015 gender equality targets for the post-2015 development agenda. Recommends: programs increasing the number of years of education and increasing the age of marriage can have a (benefit–cost ratio) BCR of 5 (citing [52]); giving women the choice of whether and when to have children could have a BCR between 90 and 150 (citing [51]). Programs improving women’s access to income generating activities have a BCR of 7 (citing [50]).</p> <p><u>Method:</u> (other) CBA <u>Perspective:</u> provider</p> <p><u>What is cost:</u> variable depending on case studies examined, but generally costs of program development/implementation</p> <p><u>Categories:</u> GBV; SRH.</p>
Norheim et al. [10]	<p><u>Aims and findings:</u> Article presents the Guidance for Priority Health Setting in Health Care (GPS-Health), initiated by the World Health Organization, which offers a set of criteria in a checklist format to be considered in addition to cost-effectiveness analysis. Recommends that cost effectiveness analysis, the main approach to establishing health priority setting, only addresses the objective of maximizing health, and it does not adequately social equity [10] (p.2).</p> <p><u>Method:</u> (other) CEA <u>Perspective:</u> service provider</p> <p><u>What is cost:</u> Criteria were developed through a process of literature review and expert consultation.</p> <p><u>Categories:</u> economic</p>
Remme et al. [11]	<p><u>Aims and findings:</u> Utilizes the “What works for women” evidence review as a basis to conduct a literature review of cost effectiveness gender-responsive interventions for HIV. 22 studies were found with a gender focus, 11 of these reported cost effectiveness or cost utility information.</p> <p><u>Method:</u> (other) CEA <u>Perspective:</u> all from the provider perspective, with one also considering societal costs.</p> <p><u>What is cost:</u> The <i>British Medical Journal’s</i> checklist for economic evaluations was used by two reviewers to assess robustness of studies. Cost per disability-adjusted life year (DALY) averted or quality-adjusted life year (QALY) gained below the country’s per capita gross domestic product was considered cost-effective.</p> <p><u>Categories:</u> GBV; SRH.</p>

A commonality of most traditional CBA/CEA studies was that costs were estimated from the provider perspective, with the exception of Tate et al. [49], which examined public and environmental costs, and one study examined in Remme et al. [11], which evaluated both societal and provider costs. A primary disadvantage of cost estimation from the provider perspective is that it hides opportunity costs to society [11].

Women's/girl's SRH is somewhat cursorily included in several of the studies reviewed, often by utilizing outcome measures related to GBV such as self-reported rape or Sexually Transmitted Infection (STI) status, one potential outcome of GBV. Some studies more directly address SRH themes through educational or training initiatives, however actual outcome measures for women's/girl's SRH tend to focus on STI status, fertility, or knowledge of SRH. There is an absence of outcome measures focused on women's/girl's experiences with SRH, for example, their access and agency to make decisions regarding SRH. Bandiera et al. [50] evaluate the effectiveness of a program that provides vocational and skills training to girls, including education on SRH, conflict/negotiation skills, and entrepreneurial skills. Outcome measures include self-reported rape, knowledge of SRH, fertility, as well as economic measures (i.e., self-employment, expenditures). Girl's welfare is reported in economic terms regarding perceptions of future employment and actual employment. Outcomes that may be critical to SRH such as girl's access to, and agency for using, contraceptives, or ability to reject sexual advances, are absent from outcome measures. It is assumed that girls will be able to negotiate better with the conflict negotiation skills element of the training, but there is no stated focus on changing negative male perceptions or actions. While the training offers some obvious advantages for girls, the nature of the outcome measures limits the ability of the study to understand how (and if) the context of SRH is changing for girls.

Remme et al. [11], evaluating CEA for GBV interventions, provide categorizations for different types of activities, often termed "interventions" in the public health literature, notably: "gender-responsive" interventions are those that address both girls/boys, men's/women's different needs in relation to one another, or explicitly aim to reduce gender inequalities, however, for the purposes of this article, "gender-responsive" refers only to the former condition. Using this typology helps to situate economic evaluations within a gender equality context. Assessing economic costs of violence against children, Pereznieta et al. [47] identify further challenges with the framing of economic evaluations of GBV related activities, mainly: violence is often assumed to be homogeneous, when in fact different types of violence (i.e., physical, psychological, sexual) and have different consequences, and further, the frequency of severity of these events is often ignored, yet both could have profound impact on cost and gender equality. Outcome measures that do not consider type of violence, or situate results within the "normal" (i.e., baseline) prevalence of violence, do not accurately portray costs and benefits, especially costs to the victims/communities. As with other categories of CBA/CEA examined, the focus is largely on short-term tangible impacts (i.e., direct costs). The lack of focus on (unequal) gender power relations, the root cause of GBV, limits the ability of the studies to understand longer-term impacts, or to speak to causality.

Studies by Tate et al. [49] and Norheim et al. [10] identify further lessons regarding the limitations of traditional economic evaluation approaches for addressing gender equality concerns. Norheim et al. [10] identify several categories of social equity concerns in a checklist format, gender among them, which are not adequately addressed in CEA. However, no specific guidance on how to account for these disparities is provided. Tate et al. [49] present a modified CBA that couples physical and social vulnerability indicators, the latter of which are tailored to flood recovery. Other methodological decisions such as avoiding additive aggregation for weighting impacts, development and application of a relative loss metric to better represent coping capacity, and transparently identifying data limitations, help to better understand distributional concerns and provides a more equitable "social framing" for the CBA. Gender relations and gender equality, however, are not explicitly discussed or examined. The scope of the paper, which examined the effectiveness of a

housing buyout program, and further, data limitations, precluded this. Still, the study demonstrates advances over traditional CBA methodologically and in the “social framing”.

Table 3 reports on studies that utilized models to address gender equality concerns including SRH and GBV. While different conceptually and methodologically, both models consider boys/girls or men/women in relation to one another; a necessary step in understanding causal mechanisms for gender equality issues. Duflo, Dupas and Kremer [52] examine the impact of two policy instruments in Kenya on dropout rates, fertility, and sexually transmitted infections (STIs). The government’s HIV educational initiative promotes abstinence until marriage and provides STI education. Another policy subsidy provides free uniforms to pupils in the last three years of primary school. The authors examine outcome variables for boys/girls including STIs, marriage, pregnancy, and dropout rate, finding mixed results for the two programs. Both programs have impacts on SRH: the educational subsidy alone reduces the dropout rate for boys/girls, and shows delayed fertility, but no effect on STIs. The HIV program alone shows fewer out of wedlock pregnancies, but more pregnancies earlier in marriage. Combining both programs reduces fertility (not as much as the educational subsidy alone), and reduces STIs. The authors recommend results are consistent with a two-factor model in which choices to be in a committed or causal relationship affect outcomes. Some primary limitations of the study are the assumptions of girls/boys agency or choice to marry and the assumption of women’s choice in pregnancy, and a failure to consider sexual violence as cause of pregnancy. MacMillan [53] proposes a life-course model for estimating the long-term costs of violent victimization. Utilizing longitudinal and retrospective national samples, he illustrates costs to victims from loss of educational and occupational attainment. A key finding is that losses are age-graded with greatest costs occurring when victimization occurs during adolescence; criminal violence during adolescence appears to disrupt educational and occupational attainment. As the majority of GBV economic evaluation studies are framed from the provider perspective [11,47], this model highlights the significant economic costs to victims of violent victimization.

Table 4 reports results of studies evaluating the effectiveness of different economic mechanisms in addressing gender equality concerns. A study by Ray-Bennett [25] evaluates the effectiveness of microfinance support to women in recovery from multiple types of natural hazards in Orissa, India. This study highlights the strengths of ethnographic research methods for evaluating the social and economic ramifications of different economic activities. While it has been posited that microfinance can reduce women’s vulnerability [24], evidence recommends mixed results; sometimes these programs serve to increase women’s vulnerability by creating micro-debts or further reinforcing class, caste and gender inequalities [25]. Results recommend a need to characterize relations between women with regards to access to opportunities (i.e., markets, policies, and institutions), delivery of these services (i.e., reliability of services, as well as fair distribution of services), and potential negative outcomes (i.e., micro-debt), in order for microfinance programs to be successful in reducing women’s vulnerability [25]. Examining multiple perspectives (i.e., participant, government, and NGO providers) in terms of costs/benefits, and characterizing relations between different spheres, is a strength of ethnographic research and it enables the author to pinpoint why microcredit was not successful in reducing women’s vulnerability, so that it might be better harnessed in the future. In this example, microfinance served to heighten gender inequalities of the poorest women through the generation of micro-debt, and restricted access to further microfinance, arising from social stigmas held about the women. A study by Baird et al. [48] also examines microfinance in the form of cash transfers. The study aims to assess the effectiveness of cash transfers to school aged girls and their families in Malawi for reducing girl’s STIs, though no regard is given to causal mechanisms or distributive concerns. While a reduction in STIs is reported, the authors provide no insight with regards to why this might be, recommending limitations of the study design.

**Table 3.** Models evaluating cost effectiveness of various gender equality concerns.

Reference	Study Aims, Key Findings and Economic Evaluation Description
Duflo, Dupas and Kremer [52]	<p><u>Aims and findings:</u> Examines the impact of two leading policy instruments in Kenya using an RCT: education subsidies (providing free uniforms in the last three years of primary school) and HIV prevention education focused on abstinence until marriage, implemented alone or jointly, on sexual behavior, pregnancy, and sexually transmitted infections (STIs). Results recommends that the education subsidy implemented alone shows reduced dropout for boys/girls, and delayed fertility, but no effect on STIs; HIV program alone led to more early pregnancies (in wedlock), but less out of wedlock; no significant reduction in pregnancies or STIs; when implemented jointly, fertility fell less than educational intervention alone, but STIs fell more; girls were 20% less likely to be infected with HS2V in seven-year follow up, no change for boys; add on component regarding condom education led to greater awareness, but not greater use.</p> <p><u>Method:</u> Model  <u>Perspective:</u> provider  <u>What is considered:</u> costs of stand-alone HIV subsidy (HIV); stand-alone education subsidy (S); joint program (S+HIV); pupil attendance rate; pregnancy and marital status.  <u>Category:</u> SRH</p>
MacMillan [53]	<p><u>Aims and findings:</u> Proposes a life-course model for estimating the long-term costs of violent victimization. Utilizes prospective, longitudinal data from a national sample of American adolescents, and retrospective data from a national sample of Canadians, to estimate income losses over the life cycle associated with violent victimization. Results recommend: incomes losses from violent victimization are age-graded, with greatest costs occurring when victimization occurs during adolescence; criminal violence during adolescence appears to disrupt educational and occupational attainment; total costs are much higher than previous research estimates.</p> <p><u>Method:</u> Model  <u>Perspective:</u> cost to criminal violence to victims.  <u>What is cost:</u> financial losses directly attributable to victimization experience (i.e., out of pocket expenses for general healthcare; insurance costs; lost wages and productivity; mental health service costs).  <u>Category:</u> SRH, GBV.</p>

**Table 4.** Studies reporting on effectiveness of economic mechanisms that influence gender equality.

Reference	Study Aims, Key Findings and Economic Evaluation Description
Ray-Bennett [25]	<p><u>Aims and findings:</u> Qualitative study examining role between microcredit and vulnerability reduction in women headed households to multiple disasters (super cyclone in 1999, floods in 2001, 2003, and drought in 2002) in Orissa, India. Results recommend that microcredit is a useful tool to replace women's livelihood assets that have been lost during disasters. However, insufficient delivery of microcredit can cause micro-debts and exacerbate caste, class and gender inequalities.</p> <p><u>Method:</u> Microfinance  <u>Perspective:</u> ethnographic study including three sets of informants (12 women-headed households, 6 government officials, 10 NGO workers) reflects consideration of provider, societal perspectives.  <u>What is considered:</u> women's access to microfinance; positive/negative economic and social outcomes of microfinance.</p>
Baird et al. [48]	<p><u>Aims and findings:</u> Assesses the effectiveness of cash transfers (to girls and their families) in Malawi for reduction of HIV and herpes simplex type 2 (HSV2) infections in never married girls aged 13–22 years using a cluster randomized trial. Monthly cash transfers to families of out-of-school girls significantly reduced HIV infection rates after 18 months for girls who were enrolled in school at baseline.</p> <p><u>Method:</u> Cash transfers  <u>Perspective:</u> provider  <u>What is considered:</u> HIV, HSV2 infection rates, reported sexual behavior, knowledge of HIV transmission;  <u>What is cost:</u> average household transfer size, administrative costs, program costs against HIVE infection averted cost estimate of USD 5,000  <u>Category:</u> SRH</p>
Smith [13]	<p><u>Aims and findings:</u> Discusses the economics of breast feeding and how the current G20 approach to the "gender gap" fails to acknowledge the ability of breastfeeding to promote children's food security and maternal and child health. Market regulations focus on potential risks of donating breast milk, rather than the health risks of exposing infants and young children to bovine-milk.</p> <p><u>Method:</u> Markets  <u>Perspective:</u> societal  <u>What is considered:</u> how market mechanisms influence breastfeeding; health impacts of breastfeeding vs. formula feeding;  <u>Category:</u> SRH; women's rights to breastfeed; food security; nutrition.</p>

A study by Smith [13] examines how current market mechanisms incentivize formula feeding (i.e., bovine-milk formula), discourage mothers from breastfeeding, and the negative impacts of this on women's and infant's health and food security. Smith highlights the healthcare benefits of breastfeeding such as the potential of breastfeeding to minimize healthcare costs, to improve children's food security, to provide secondary impacts on fertility (e.g. natural birth spacing when breastfeeding), and to provide cognitive and immune benefits for infants. Market regulations focus on potential risks of donating breast milk, rather than the health risks (and costs) of exposing infants and young children to bovine-milk, leading to negative benefits for women's SRH and women's rights. Similar to Ray-Bennett's findings, Smith's study recommends that attention be paid to institutional mechanisms, market and policy regulations, and how these impact the outcome of activities. While formula producers are certainly benefitting economically, in part by incentivizing hospitals to promote formula use, women and children are not.

## 5. Discussion

Many studies examined here had a reductive set of outcome measures for activities. Outcome measures for women's/girl's sexual and reproductive health, for instance, are often restricted to fertility, STI status, self-reported rape, and contraception use. These are not holistic representations of SRH or GBV, as they often homogenize survivors, violence, environment (i.e., including variables such as displacement), and women's experience with SRH. Resistance, backlash, lack of control over women's bodies, and other potential negative outcomes need to be included among outcome measures to better inform SRH and GBV. Studies recommend GBV is underreported and further, marital status, urban residence, and increased age, are factors associated with women who are more likely to formally report violence compared to other groups of women [54]. Experiences, such as employment experiences spanning unpaid care work, in addition to formal paid employment, should be considered within outcome measures. Metrics for "active" representation should be included in outcome measures, as many studies have shown inclusion does not equal representation. These minimum criteria should be informed by social sciences studies in the specific context, for instance, studies informing on the prevalence and type of violence, or prioritizing investment activities with regards to other threats to people's wellbeing. Most studies examined do not consider the prevalence of adverse events such as violence or crises, which can in turn impact economics, as well as gender equality. As the gender studies in the background highlighted, these are all salient concerns for disaster risk and environmental management in both developing and developed contexts.

## 6. Conclusions

This article has drawn on fundamental principles and evidence from 40+ years of scholarship at the nexus of gender, disasters, and development to conceptualize a more equitable "social framing" for cost-benefit and related economic assessments. Economic case studies focused on gender equality were then reviewed and the "social framing" was critiqued to evaluate: (1) where and how the "social framing" goes wrong; and (2) how this can be done better. Results recommend that the majority of studies reviewed, with some notable exceptions, are not "gender-responsive", nor are they informed by gender theory. "Gender" still tends to be equated with "women", who are considered a homogenous group. As the majority of studies are not "gender-responsive", they do not examine relationships between the sexes. This severely limits (if not precludes) the ability of these studies to speak to the root causes of gender inequalities, or the longer-term impacts of activities on gender equality. Outcome measures are often reductive, overlooking important variables such as girl's/women's experiences and control over their bodies, burden of unpaid care work, quality of employment, or the type of threat (such as violence) experienced, and associated outcomes. Progress is also evident, as modification to traditional cost-benefit approaches provide greater characterization of distributive concerns, for example, illustrating heterogeneity in costs and benefits to different groups of society. Furthermore, a limited number of studies are "gender-responsive", while others detail diversity between members

of the same sex. Other contemporary economic approaches consider the impacts of GBV throughout a person's lifetime; details often ignored in traditional approaches. Collectively, results show that the "social framing" for economic assessments is often poorly constructed, which does little good for advancing gender equality. There is a strong evidence base, and practical guidance, that has emerged from gender scholarship to remedy this problem. Gender equality and disaster risk are inextricably linked, posing many challenges to disaster risk- and environmental-management decision-makers. Results of this review can be used by disaster risk- and environmental-management decision-makers to better identify, and evaluate, investment opportunities that can support gender equality. Bringing together gender scholars and economists to formally establish guidelines for the "social framing" of economic assessments would be a positive next step for gender equality.

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