

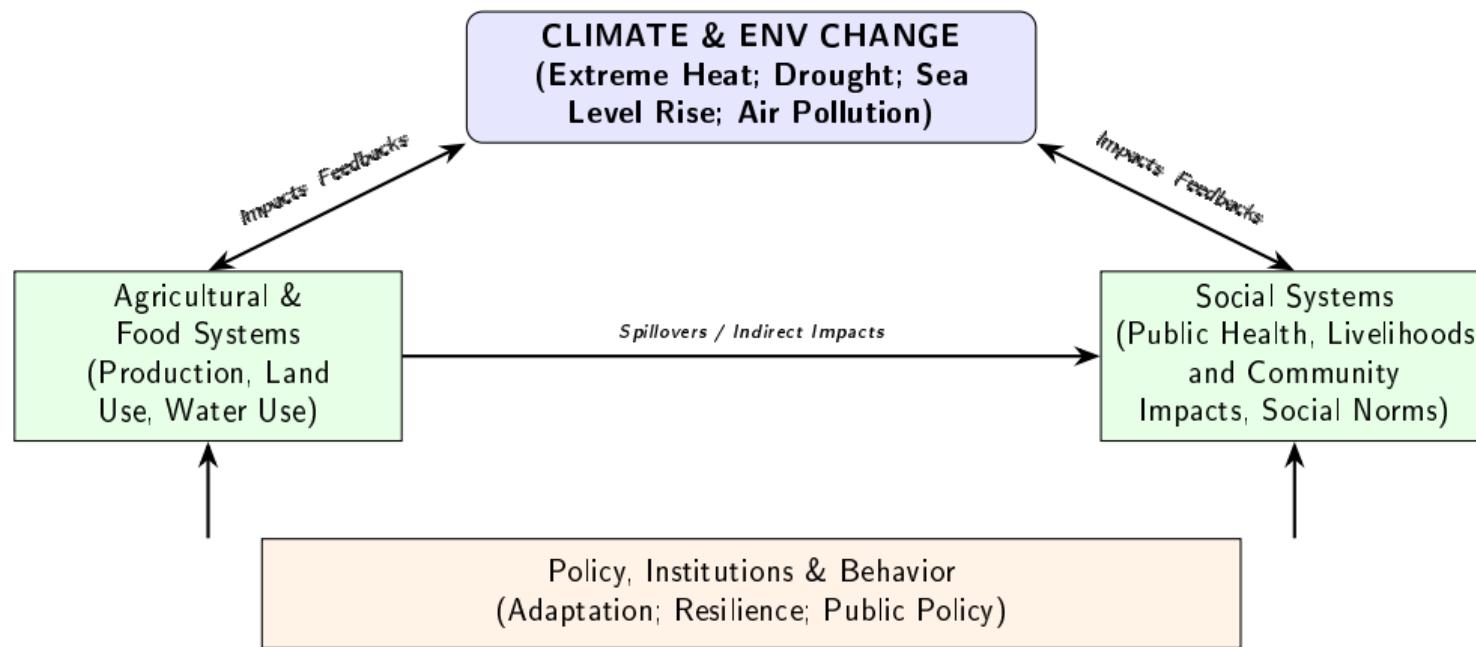
# Climate Change, Intimate Partner Violence, and the Moderating Effects of Climate Resilience Initiatives

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# Research Program: A Conceptual Overview



# Example Research Studies

- ▶ Climate change: Impact and adaptation for **agri-food systems**
  - ▶ Water institutions and land allocation (Cobourn et al., 2022 AJAE; Browne and Ji, 2023 JEEM)
  - ▶ Climate expectations and decision-making (Ji and Cobourn, 2021 ERE)
- ▶ Climate and environmental impact on **social systems**
  - ▶ Resource extraction and social norms (Guimbeau et al., 2023 WD)
  - ▶ Environmental and climate implications of the clean energy transition (Ji et al. 2024, under review at JPAM)
- ▶ Climate change at the nexus: **agri-food and social systems impacts**
  - ▶ Saltwater intrusion, land use, and food security (Guimbeau et al., 2024 JEEM)
  - ▶ This paper

# Introduction

- ▶ Increased frequency and severity of extreme and unexpected weather events - heatwaves, droughts and floods
  - ▶ Act as a “threat multiplier” through channels of lost income as well as intra-family dynamics (UN Women, 2022)
  - ▶ Intensifying susceptibilities to forced migration, conflicts, and gender-based violence
- ▶ Climate change impacts are not gender neutral
  - ▶ Women disproportionately impacted in developing nations
    - ▶ Extensive involvement in agriculture
    - ▶ Existing political, social, and economic inequities
    - ▶ Gender-specific roles rooted in cultural norms
- ▶ Need for an assessment of the gender-differentiated impacts of climate change; how they manifest through existing inequalities

# Coping with climate change

- ▶ Global challenge: How to respond to climate impacts
- ▶ The growing role of climate finance
  - ▶ COP15 (2009 Copenhagen): target for \$100 billion/year commitment by 2020
  - ▶ Climate finance for developing countries reached \$118 billion in 2022 (OECD, 2024) Global Climate Finance 2013-2022
  - ▶ Justification: investing in resilience and adaptation prevents forced migration, loss of livelihoods, and social unrest
- ▶ Critical need for evidence on the effectiveness of climate finance
  - ▶ Understanding which interventions work, for whom, and through what mechanisms is crucial
  - ▶ What social spillovers do climate finance initiatives have?

# This paper: focus on Bangladesh

- ▶ One of the most vulnerable countries to climate change in the world
  - ▶ Nearly 40% of the population directly employed in agriculture
  - ▶ Potential loss of one third of its agricultural GDP by 2050
  - ▶ Multiple threats: drought (Li 2023), cyclones and floods (Patel 2024; Lane 2024), saltwater intrusion (Guimbeau et al. 2024)
- ▶ Climate change exacerbates existing gender inequalities; potentially undermines hard-won achievements made in bridging gender gaps
  - ▶ Alarming incidence of IPV: 73% of ever-married women experiencing one or more forms of intimate partner violence at least once in their lifetime (Bangladesh Bureau of Statistics, 2016)
  - ▶ Over one-third of men aged between 15-49 agree that wife-beating is justified for several reasons (DHS, 2007)



# This paper

We have two objectives in this paper:

- ① Quantify the effects of climate shocks on women's attitudes towards intimate partner violence
  - ▶ Literature suggests that tolerance to IPV is strongly correlated with actual experience of IPV
  - ▶ We document the extent to which these effects diverge across existing socio-economic vulnerabilities
- ② Evaluate whether nationally-led climate-resilience initiatives mitigate the negative impacts of climate shocks
  - ▶ The Bangladesh Climate Change Trust (BCCT) financed community-based projects that promote climate adaptation and resilience
  - ▶ We quantify the effectiveness of BCCT projects at attenuating the harmful impacts of climate shocks on women's wellbeing
  - ▶ We also examine potential mechanisms through which BCCT enhances climate resilience

## Preview of results

- ▶ The impact of a higher frequency of dry months on tolerance of IPV is not statistically different from zero for the average Bangladeshi women
- ▶ But drought increases IPV tolerance for two groups of women
  - ① Those who live in agriculture-dependent communities
  - ② Those in the lowest three wealth quintiles, with effects stronger for poorest women

## Preview of results

- ▶ Proximity to a BCCT project completely counteracts the effect of droughts in agricultural communities across all wealth strata
  - ▶ Positive but smaller attenuation effects for other development assistance projects
  - ▶ Active BCCT projects play a key role in improving women's welfare through access to media, transport facilities, electricity, and cash earnings
- ▶ Resilience effects transmitted through protection to rainfed *aman* season agriculture
  - ▶ Proximity to BCCT buffers rainfed agricultural yield loss from droughts
  - ▶ Also mitigates the negative effects of drought on acreage of rainfed crops
  - ▶ No effects on yield and acreage of irrigated (*boro* season) crops

## Contribution to the literature: Climate Impact

- ▶ Socio-economic impact of climate change in developing nations (Maccini and Yang 2009, Deschenes and Greenstone 2011, Geruso and Spears 2018, Banerjee and Maharaj 2020, Liu et al. 2023, Guimbeau et al. 2024)
- ▶ Domestic violence, gender equality and women's agency in the developing world (Abiona and Foureaux-Koppensteiner 2018, Cools et al. 2020, Epstein et al. 2020, Guimbeau et al. 2022, Hossain et al. 2022)
- ▶ Relatively scarce literature on linkages between climate and violence, especially gender-based violence in developing countries
  - ▶ Only two IPV papers in Burke et al. (2024)'s review and meta-analysis on climate and conflict
  - ▶ A growing literature: Sekhri and Hossain (2023 JAERE, India); Diaz and Saldarriaga (2023 JHE, Peru); Pavanello and Zappala (2024 WP, US); Aguilar-Gómez and Salazar-Díaz (2025 WP, Mexico);
  - ▶ Agriculture is an important mechanism in moderating the climate-violence relationship

# Contribution to the literature: Climate adaptation

- ▶ Direct (costly) adaptation:
  - ▶ Crop switching (Burke and Emerick 2016; Cui 2020; Ji and Cobourn 2022; Guimbeau et al. 2024; Cui and Zhong 2024; Sumner et al. 2025)
  - ▶ Air conditioning (Barreca et al., 2016; Park et al., 2020, 2022)
- ▶ Economic assistance:
  - ▶ Cash transfer (Banerjee and Maharaj 2020; Garg et al. 2020; Macours et al. 2022; Premand and Stoeffler 2023)
  - ▶ Credit access (Burgess et al. 2017; Lane 2024)
  - ▶ (Subsidized) risk-sharing: Crop insurance (Mobarak and Rosenzweig 2013; Karlan et al. 2014); Flood insurance (Gallagher 2014; Wagner 2022; Sastry 2023)
- ▶ Spillover effects from social policies
  - ▶ Gun and substance control policies (Colmer and Doleac, 2024; Pavanello and Zappala, 2025)
  - ▶ Access to healthcare (Mullins and White 2020; Evans et al. 2025)
- ▶ Our paper is one of the first to evaluate targeted public climate spending programs in the developing world

# Relevance to Canada

- ▶ Vulnerability of agricultural and food systems
  - ▶ Droughts in the Prairies; extreme weather events in Ontario
  - ▶ Agricultural adaptation: crop switching; irrigation;
- ▶ Social implications of climate shocks
  - ▶ Impacts on mental health, wellbeing, and gender-based violence
- ▶ Co-benefits of climate adaptation and resilience building
  - ▶ Adapting within the food system can have wider social spillovers

# Data

- ▶ 4 rounds of the Bangladesh Demographic and Household Survey (DHS) from 2007 to 2017
  - ▶ Samples of women aged 15-49
  - ▶ A pooled cross-sectional dataset, and use the geographic coordinates of each surveyed cluster across rounds to merge with the geo-coded climate data
  - ▶ Variables related to attitudes towards wife-beating, proxies for other dimensions of women's status
  - ▶ The domestic violence module available only in the 2007 BDHS to measure the experience of spousal violence
    - ▶ This sample provides information on whether ever-married women had ever experienced physical or sexual abuse committed by their husbands

[Location of BDHS clusters](#)[Heatmap of IPV Tolerance](#)

# Data

- ▶ Weather data from EU's Copernicus Climate Change Service
  - ▶ Meteorological indicators from 1980 to obtain gridded monthly meteorological data at a spatial resolution of  $0.1^{\circ} \times 0.1^{\circ}$
  - ▶ Temperature, precipitation, vapor pressure, wind speed, solar radiation flux
  - ▶ Nonlinear transformation into apparent (feels-like) temperature (LaPolo 2023)
  - ▶ We match the latitude-longitude of each sampled cluster over DHS rounds to the geo-coded weather data
    - ▶ We use inverse-distance matching to obtain local measures of climate through gridded climatic observations

Evidence of Climate Change

Heatmap of Drought Presence

# Data

- ▶ Additional datasets for climate vulnerability indices, pre-treatment geographic and socio-economic covariates at the sub-district level
- ▶ Bangladesh Climate Change Trust (BCCT)
  - ▶ We digitize the list of approved and finalized projects from the BCCT's official site on the Bangladesh National Portal
  - ▶ Information on project name, implementing agency, and projected costs
  - ▶ Starting dates, originally scheduled and actual end dates for most projects
  - ▶ Location data from the project title, supplementary documents on the portal, and from the Ministry of Environment, Forest, and Climate Change
  - ▶ We pinpoint the sub-district locations of 183 projects spread throughout Bangladesh with varying start and ending dates spanning from 2010 and 2020

## Empirical strategy

$$y_{icdmt} = \beta_1 \text{drought}_{cdmt-36} + \beta_2 \text{wet}_{cdmt-36} + \beta_3 \text{heat}_{cdmt-36} + \gamma W_{cdmt} + \theta X_{icdmt} + \omega_{dm} + \mu_{dt} + \epsilon_{icdmt} \quad (1)$$

- ▶  $y_{icdmt}$ : =1 if the respondent agrees with at least one of the five justified reasons for wife-beating
- ▶  $\text{drought}_{cdmt-36}$ : the cumulative number of months over the past 3 years that rainfall realization was least **1 SD below** the historical monthly average
- ▶  $\text{wet}_{cdmt-36}$ : the cumulative number of months over the past 3 years that rainfall realization was least **1 SD above** the historical monthly average
- ▶  $\text{heat}_{cdmt-36}$ : the cumulative number of months over the 3 years that temperature realization was least **1 SD above** the historical monthly average
- ▶  $W_{cdmt}$ : a vector of contemporaneous temperature (in bins) and rainfall measures
- ▶  $X_{icdmt}$ : a vector of controls for individual and household characteristics: age, residency, education, age of cohabitation, religion, number of young children

## Identifying assumptions

- ▶ Equation (1) also includes district-by-month and district-by-year fixed effects to account for temporal variations across districts including local seasonality and regional trends
- ▶ Assumption: Conditional on the controls for contemporaneous weather, location-specific seasonality, and on other variables in the model
  - ▶ There are no omitted variables that are correlated with both the number of dry months in the 3 years prior to the survey year and with women's attitudes towards IPV
  - ▶ Weather shocks are as good as random in this case

# Main results: Droughts increase vulnerable women's acceptance of IPV

## The effects of climate shocks on women's attitudes towards IPV

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to:					
	All (1)	Agriculture- Dependent Communities (2)	Non Agriculture- Dependent Communities (3)	Three lowest quintiles (4)	Two lowest quintiles (5)	Lowest quintile (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.005 (0.004)	0.010** (0.005)	-0.008 (0.008)	0.009** (0.004)	0.011** (0.005)	0.017** (0.007)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	-0.003 (0.004)	-0.001 (0.005)	0.003 (0.011)	-0.006 (0.005)	-0.004 (0.006)	0.000 (0.008)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	-0.003 (0.003)	-0.004 (0.004)	-0.003 (0.005)	-0.004 (0.004)	-0.005 (0.005)	-0.006 (0.006)
Observations	47,885	23,108	22,608	27,085	17,703	8,657
R-squared	0.110	0.118	0.120	0.112	0.131	0.156
Individual and household controls	✓	✓	✓	✓	✓	✓
Weather controls	✓	✓	✓	✓	✓	✓

## Robustness and other results

- ▶ Alternative specifications, population sorting, and additional controls
- ▶ Monsoon drought shocks and growing degree days
- ▶ Heterogeneous effects for the lowest wealth quintile: Heterogeneity by sociodemographics
  - ▶ We examine factors that could potentially mitigate the main effects
  - ▶ Sectoral area of residence, literacy status, and economic prosperity
- ▶ Effects by decade of birth Heterogeneity by birth cohort
  - ▶ We augment equation (1) with indicators for women's birth decades, and separate interaction terms for the frequency of dry months and each birth cohort
  - ▶ Women's acceptability of IPV across all birth decades are impacted by dry shocks
  - ▶ Effects are relatively more pronounced for women born in later cohorts in the poorest households

## Robustness and other results

- ▶ We examine whether wealth and agriculture dependency compound each other when communities experience drought
  - ▶ We present results where the samples are partitioned based on both wealth strata and the share of employment in agriculture at the upazila (sub-district) level
  - ▶ We find that poorer women living in agriculture-dependent communities are even more likely to justify IPV when dry spells increase
- ▶ We examine whether intra-family employment structure plays a role in shaping the climate-IPV relationship
  - ▶ We consider households where the husband is employed in the agricultural sector
  - ▶ We also focus on samples by women's primary occupation and employment status
  - ▶ Results are evident mostly for unemployed women in agricultural households

# Other results: Experience of IPV

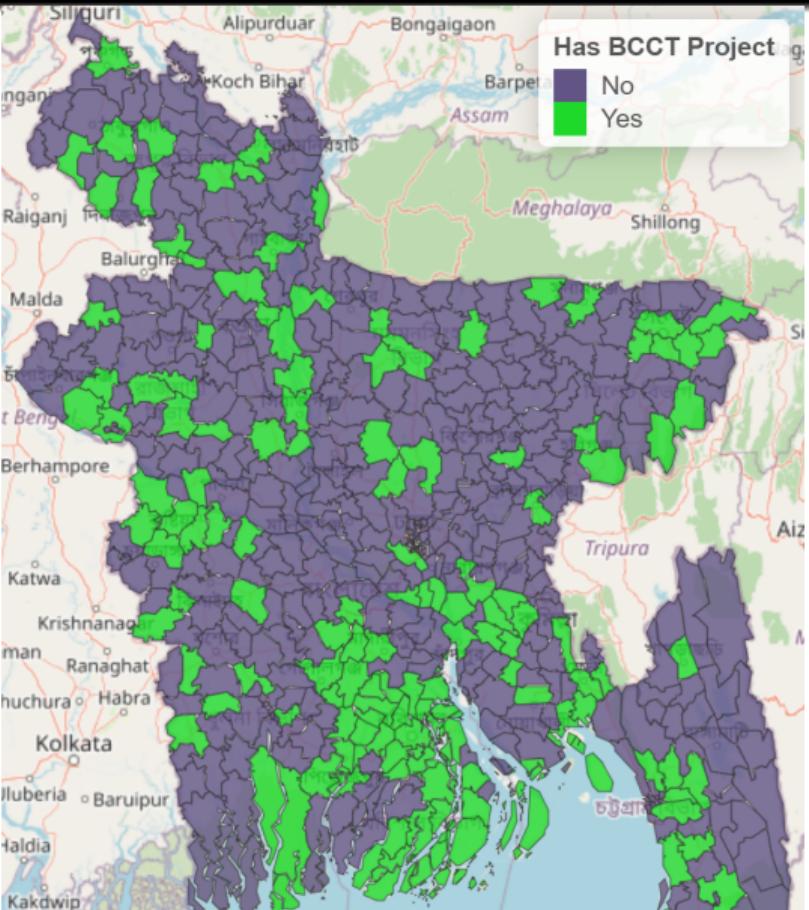
**Table 4: The effect of climate shocks on the experience of IPV**

	Sample restricted to: women employed in agriculture			
	Form of domestic violence:			
	physical	sexual	either physical or sexual	both physical and sexual
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.004 (0.013)	0.033*** (0.012)	0.021 (0.018)	0.015* (0.008)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	0.020 (0.016)	-0.017 (0.013)	-0.001 (0.018)	0.005 (0.010)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	-0.028** (0.014)	0.014 (0.011)	-0.014 (0.015)	0.000 (0.009)
Observations	589	589	589	589
R-squared	0.104	0.113	0.145	0.080

## Other results: Agency indicators

# Bangladesh Climate Change Trust

- ▶ Launched in 2008 and operational since 2010, \$400 million funding
  - ▶ Domestic climate fund working with NGOs, ministries and the private sector
  - ▶ BCCRF (Bangladesh Climate Change Resilience Fund) - led by the World Bank, dissolved in 2016
- ▶ Wide project focus: sustainable agriculture, water management, disaster management, renewable energy, capacity building, etc.
  - ▶ Targets adoption of climate-tolerant technologies, biodiversity and environmental initiatives, and disaster response
  - ▶ Some of the projects directly target women
- ▶ Sample Information Table    Sample LLM based classification
- ▶ 183 projects coded between 2010-2020
  - ▶ Matched to subdistrict (*upazilla*) + year level



## Moderating Effects of BCCT: Methodology

- ▶ We extend our strategy to assess possible mitigative effects using the equation below:

$$y_{icsdmt} = \beta_1 \text{drought}_{csdm} + \kappa \text{BCCTproject}_{sdm} + \pi (\text{drought}_{csdm} \times \text{BCCTproject}_{sdm}) + \gamma W_{csdm} + \theta X_{icsdmt} + \omega_{dm} + \mu_{dt} + \epsilon_{icsdmt} \quad (2)$$

- ▶  $\text{BCCTproject}_{sdm}$  equals one when the respondent's cluster falls within a sub-district  $s$  that had at least one BCCT project at the time the DHS survey was conducted
- ▶ The coefficient of interest is  $\pi$ , the additional effect of dry shocks for respondents in sub-districts with active BCCT projects
- ▶ We are also interested in the net effect of drought on acceptance of IPV in sub-districts with active BCCT projects,  $\beta + \pi$

**Climate shocks, attitudes towards IPV and BCCT projects**

Dependent Variable: Justifies IPV for at least one reason

Sample restricted to:

Respondents in agriculture-dependent communities

	(1)	(2)	(3)	(4)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.011** (0.005)	0.010** (0.005)	0.011** (0.005)	0.010* (0.005)
BCCT project (active before survey)	0.062* (0.036)	0.061* (0.036)		
Number of dry months x BCCT project	-0.018** (0.008)	-0.018** (0.008)		
Inactive BCCT project (active after survey)		-0.011 (0.037)		
Number of dry months x inactive BCCT project		0.002 (0.005)		
Number of BCCT projects			0.050* (0.030)	0.048 (0.030)
Number of dry months x num of BCCT projects			-0.015** (0.007)	-0.015** (0.007)
Number of inactive BCCT projects				-0.024 (0.026)
Number of dry months x num of inactive projects				0.002 (0.004)
Joint test:				
num. of dry months + (num. of dry months x BCCT) = 0	-0.007	0.008	-0.005	-0.005
F-statistic	0.84	0.92	0.42	0.54
p-value	[0.360]	[0.337]	[0.516]	[0.540]
Observations	23,108	23,108	23,108	23,108
R-squared	0.118	0.118	0.118	0.118

## Selection in project locations

- ▶ We might be worried that BCCT projects are not randomly allocated:
  - ➊ Funding might target areas that are more vulnerable (although anecdotally, equity is not an explicit criteria in funding allocation) [Balance Table](#)
  - ➋ BCCT funds might crowd-in or crowd-out other development assistance programs

## Selection in project locations

- ▶ We address this by:
  - ▶ Leveraging the timing of BCCT project implementation: projects inactive at the time of the survey should not mitigate climate impact
  - ▶ Matching on observables: match women in BCCT-receiving subdistricts to otherwise similar women in non-receiving subdistricts
  - ▶ Explicitly control for the presence of other development aids: USAID, JICA, World Bank, Asian Development Bank, EU, India, UNDP, Islamic Development Bank, and DfID
  - ▶ Excluded 5 subdistricts that received BCCRF projects

**Table 6: Climate shocks, attitudes towards IPV and BCCT projects**

		Dependent Variable: Justifies IPV for at least one reason								
		Sample restricted to: Respondents in agriculture-dependent communities								
		All (1)	Three lowest quintiles (2)	Two lowest quintiles (3)	Lowest quintile (4)	All (5)	Three lowest quintiles (6)	Two lowest quintiles (7)	Lowest quintile (8)	
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)		0.011** (0.005)	0.010* (0.005)	0.011* (0.006)	0.022*** (0.008)	0.010** (0.005)	0.009* (0.005)	0.010 (0.006)	0.020** (0.008)	
BCCT project (active before survey)			0.062* (0.036)	0.077* (0.040)	0.038 (0.046)	0.080 (0.074)	0.061* (0.036)	0.075* (0.040)	0.037 (0.046)	0.076 (0.074)
Number of dry months x BCCT project			-0.018** (0.008)	-0.020** (0.008)	-0.020** (0.010)	-0.035** (0.014)	-0.018** (0.008)	-0.020** (0.008)	-0.020** (0.010)	-0.035** (0.014)
Inactive BCCT project (active after survey)							-0.011 (0.037)	-0.034 (0.041)	-0.034 (0.048)	-0.094* (0.055)
No. of dry months x inactive BCCT project							0.002 (0.005)	0.005 (0.006)	0.005 (0.007)	0.012 (0.009)
Joint test: No. of dry months + (No. of dry months x BCCT) = 0		-0.007	-0.010	-0.009	-0.013	-0.008	-0.011	-0.010	-0.015	
F-statistic		0.839	1.306	0.820	0.781	0.921	1.507	0.973	1.022	
p-value		[0.360]	[0.253]	[0.365]	[0.377]	[0.337]	[0.220]	[0.324]	[0.312]	
Observations		23,108	16,954	11,889	6,145	23,108	16,954	11,889	6,145	
R-squared		0.118	0.118	0.134	0.159	0.118	0.118	0.134	0.159	

**Climate shocks, attitudes towards IPV and aid projects: BCCT and Other Development Assistance**

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Dependent Variable: Justifies IPV for at least one reason

Sample restricted to:

Respondents in agriculture-dependent communities

	Three lowest quintiles (1)	Two lowest quintiles (2)	Lowest quintile (3)	Three lowest quintiles (4)	Two lowest quintiles (5)	Lowest quintile (6)
<b>Panel A</b>						
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.013** (0.005)	0.013** (0.006)	0.020** (0.008)	0.014*** (0.005)	0.014** (0.006)	0.022*** (0.008)
Other development project (within 10 km) (active before survey and ongoing)	0.044 (0.033)	0.032 (0.039)	-0.006 (0.054)	0.041 (0.034)	0.034 (0.039)	-0.006 (0.055)
Number of dry months x other development project	-0.009** (0.005)	-0.008 (0.006)	-0.002 (0.008)	-0.009* (0.005)	-0.009 (0.006)	-0.002 (0.008)
BCCT project (active before survey and ongoing)				0.071* (0.040)	0.033 (0.046)	0.080 (0.074)
Number of dry months x BCCT project				-0.019** (0.008)	-0.019** (0.010)	-0.035** (0.014)
Observations	16,954	11,889	6,145	16,954	11,889	6,145
R-squared	0.118	0.134	0.158	0.118	0.134	0.159
<b>Panel B</b>						
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.009* (0.005)	0.009 (0.006)	0.019** (0.008)	0.010* (0.005)	0.010 (0.006)	0.021** (0.008)
Number of other development projects (within 10 km) (active before survey and ongoing)	0.001 (0.008)	-0.003 (0.010)	-0.003 (0.012)	0.001 (0.008)	-0.003 (0.010)	-0.003 (0.012)
Number of dry months x num of other dev. Projects	-0.000 (0.001)	0.001 (0.001)	0.001 (0.002)	-0.000 (0.001)	0.000 (0.001)	0.001 (0.002)
Number of BCCT projects				0.055* (0.033)	0.030 (0.035)	0.072 (0.051)
Number of dry months x Num of BCCT projects				-0.016** (0.007)	-0.016* (0.009)	-0.030** (0.012)
Observations	16,954	11,889	6,145	16,954	11,889	6,145
R-squared	0.117	0.134	0.158	0.118	0.134	0.159

## Additional robustness checks

- ▶ Control for a number of pre-BCCT covariates at the sub-district level
  - ▶ Geographical factors and economic variables
  - ▶ Climate vulnerability: composite index for crop yield susceptibility, measures of vulnerability related to natural disasters, fish harvest, road and rail infrastructure
- ▶ Include only those projects that were active at the time of the survey
- ▶ Exclude projects that were introduced most recently during the survey year

BCCT Robustness Checks

# BCCT and agricultural resilience

- ▶ BCCT targets the adoption of climate-tolerant technologies, disaster response, and resilience
- ▶ We want to examine whether BCCT protects drought impacts on agriculture
- ▶ Additional panel data spanning 2000-2018 on:
  - ▶ Land use data from CLMS (300m resolution); differentiate between rainfed and irrigated agriculture
  - ▶ Crop yield proxy through NDVI differences between the start and end of the monsoon and dry seasons

**Table 9: The Effects of BCCT Projects on Mitigating Agricultural Impacts of Drought Shocks**

	Dependent Variable			
	% Rainfed Crop	% Irrigated Crop	Aman Season NDVI	Boro Season NDVI
	(1)	(2)	(3)	(4)
<b>Panel A</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	-0.0043* (0.0023)	-0.0102*** (0.0031)	-0.0045** (0.0023)	0.0042* (0.0025)
Active BCCT project	-0.0046 (0.0121)	-0.0172 (0.0198)	-0.0489*** (0.0186)	-0.0308* (0.0170)
Number of dry months (past 3 years) x Active BCCT project	0.0045* (0.0025)	-0.0019 (0.0041)	0.0097** (0.0040)	0.0019 (0.0039)
Degree Days	✓	✓	✓	✓
Heat and wet months	✓	✓	✓	✓

# Access to Information

- ▶ The increase in women's wellbeing near BCCT project sites may be prompted by the upswing in economic activities with subsequent impacts on IPV acceptance
- ▶ Active BCCT projects play significant roles in enhancing access to media, in earning cash, and in utilizing transport facilities
- ▶ These effects are generally more pronounced among the most vulnerable in the lowest wealth quintile

## The impact of BCCT and other active projects

	Sample restricted to: Respondents in agriculture-dependent communities							
	All	Three lowest quintiles	Two lowest quintiles	Lowest quintile	All	Three lowest quintiles	Two lowest quintiles	Lowest quintile
	Dependent Variables:							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
BCCT project (=1) (active at survey)	0.034** (0.016)	0.023 (0.019)	0.031* (0.019)	0.020 (0.018)	-0.054 -0.042	-0.047 -0.053	0.003 -0.069	0.005 -0.096
Other development project (=1) (active at survey)	0.012 (0.010)	0.002 (0.011)	0.000 (0.011)	0.001 (0.010)	0.009 -0.013	0.023 -0.016	0.032* -0.019	0.046* -0.027
Observations	23,265	17,073	11,988	6,203	14,608	10,626	7,358	3,731
R-squared	0.248	0.136	0.092	0.080	0.095	0.102	0.118	0.157
	<u>Earns cash</u>				<u>Toilet facilities share</u>			
	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
BCCT project (=1) (active at survey)	0.044** (0.020)	0.054** (0.023)	0.061** (0.028)	0.062 (0.042)	-0.008 (0.017)	-0.010 (0.022)	-0.038 (0.028)	-0.053 (0.042)
Other development project (=1) (active at survey)	-0.005 (0.016)	0.005 (0.018)	0.004 (0.021)	-0.013 (0.031)	-0.005 (0.011)	0.002 (0.013)	-0.009 (0.016)	0.015 (0.024)
Observations	8,947	7,037	5,131	2,733	22,400	16,220	11,195	5,614
R-squared	0.211	0.222	0.233	0.237	0.094	0.099	0.118	0.161
	<u>Transport</u>				<u>Electricity</u>			
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
BCCT project (=1) (active at survey)	0.030* (0.017)	0.049** (0.020)	0.069*** (0.023)	0.092*** (0.030)	-0.011 (0.015)	-0.017 (0.019)	0.028 (0.022)	0.058** (0.025)
Other development project (=1) (active at survey)	0.014 (0.010)	-0.008 (0.012)	-0.013 (0.014)	-0.009 (0.017)	0.030*** (0.010)	0.023** (0.012)	0.011 (0.013)	-0.023 (0.014)
Observations	23,284	17,088	11,995	6,204	23,284	17,088	11,995	6,204
R-squared	0.232	0.211	0.207	0.222	0.337	0.310	0.348	0.331

# Conclusion

- ▶ This paper empirically documents how climate-induced weather shocks can generate detrimental social spillovers along existing social, economic, and cultural inequalities in developing countries
- ▶ An increase in the frequency of dry months leads to a sizeable increase in tolerance of IPV among poor women and women living in agriculture-dependent areas
- ▶ The implementation of BCCT projects in communities reliant on agriculture eliminates the adverse impact of dry shocks on women's likelihood of accepting IPV
- ▶ Taken together, our research contributes to the literature by providing a comprehensive assessment of changing climate and women's agency, as well as effective ways to mitigate the climate-IPV relationship.

# Ongoing and Future Research: Domestic/North American work

- ▶ Agricultural land use and productivity under climate and environmental change
  - ▶ Industry-specific impacts: field crops, dairy products
  - ▶ New opportunities: agri-voltaics; payment for ecosystem services
- ▶ Environmental pollution and ecosystem services
  - ▶ Valuing lake water quality and species (Weng et al., 2025, under review at JEEM)
  - ▶ Social impacts of forever chemicals (PFAS): impacts on educational outcomes (target journal: Journal of Human Resources); impacts on the housing market (target journal: JEEM)

# Ongoing and Future Research: International work

- ▶ Climate Change: Social-Ecological System Resilience & Human Well-being
  - ▶ Mangrove ecosystems in Indonesia: on mental health and cognitive outcomes (target journal: JDE/JEEM); on promoting conservation and restoration (grant proposal submitted for pilot study)
  - ▶ Saltwater intrusion and community wellbeing in Bangladesh (grant proposal submitted for RCT)

## Appendix: Climate Finance Trends

## **Climate finance for developing countries**

### Amounts provided and mobilised by developed countries, billion USD



The gap in the private finance series in 2015 is due to the implementation of enhanced measurement methodologies. As a result, private flows for 2016-22 cannot be directly compared with private flows for 2013-14.

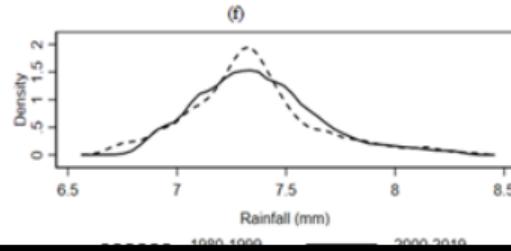
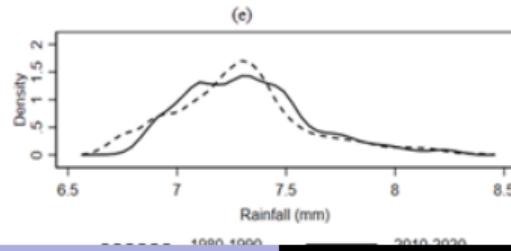
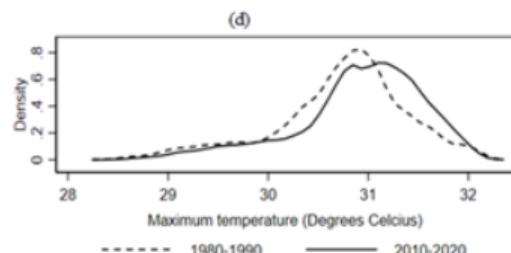
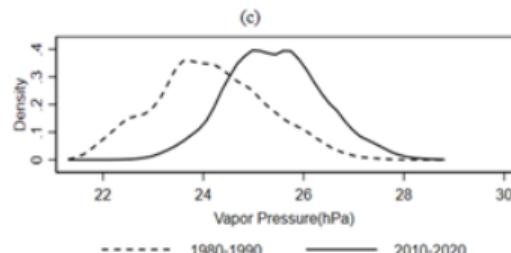
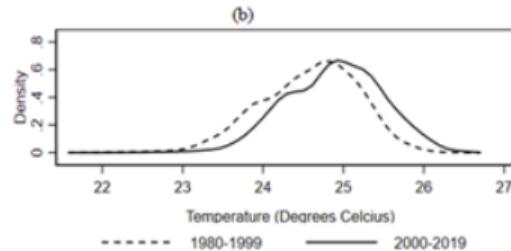
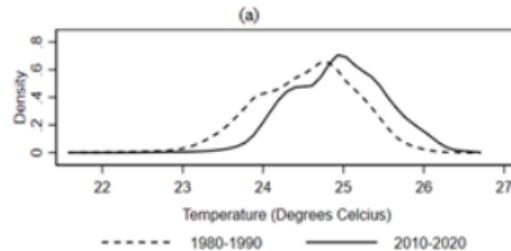
Source: OECD (2024). Climate Finance Provided and Mobilised by Developed Countries in 2013-2022.

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## Location of BDHS Clusters



## Kernel densities, 1980-2020





## Summary Statistics

**Table 1: Summary statistics of selected variables**

	Mean	Standard Deviation
<b>Panel A: Empowerment indicators</b>		
Attitudes towards DV (=1 if agrees with at least one reason)	0.268	0.443
Participates in no decision	0.168	0.374
Decision index	0.671	0.392
Freedom of movement	0.670	0.470
Control over own earnings	0.576	0.494
<b>Panel B: Experience of domestic violence (DHS 2007 only)</b>		
Physical	0.190	0.392
Sexual	0.107	0.309
Physical and/or sexual	0.240	0.427
Physical and sexual	0.057	0.231
<b>Panel C: Weather-related variables</b>		
Number of dry months	5.670	2.495
Number of wet months	4.420	1.734
<b>Panel D: Women and household characteristics</b>		
Respondent's current age	31.193	9.030
Husband's age	40.091	11.133
Rural (=1 if in rural area)	0.723	0.448
Women's education:		
Primary	0.307	0.461
Secondary	0.374	0.484
Tertiary	0.093	0.291
Husband's education:		
Primary	0.297	0.457
Secondary	0.288	0.453
Tertiary	0.142	0.349

# Other results: Agency indicators

**Table A6: The effects of climate shocks on other agency indicators**

	Sample restricted to: Agricultural households in the lowest quintile			
	Dependent variable:			
	No participation in decision-making (1)	Decision-making index (2)	freedom of movement (3)	control over earnings (4)
<b>Panel A (Agricultural households)</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.018* (0.010)	-0.014* (0.008)	0.001 (0.012)	-0.023** (0.009)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	0.014 (0.013)	-0.004 (0.006)	-0.020 (0.013)	-0.008 (0.009)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	0.027** (0.013)	-0.007 (0.006)	0.019 (0.012)	-0.003 (0.007)
Observations	999	2,863	1,000	2,371
R-squared	0.162	0.121	0.203	0.095
<b>Panel B (Women employed in agriculture)</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.034*** (0.013)	-0.017** (0.008)	0.018 (0.014)	-0.019* (0.010)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	0.004 (0.018)	-0.001 (0.007)	-0.003 (0.014)	-0.004 (0.010)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	0.038** (0.019)	-0.005 (0.006)	0.020 (0.014)	-0.006 (0.007)
Observations	735	2,514	736	2,060
R-squared	0.194	0.134	0.250	0.102

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## Climate shocks and attitudes towards IPV: Heterogeneous effects

Dependent Variable: Justifies IPV for at least one reason

Sample restricted to: lowest quintile

	<u>Residence</u>	<u>Literacy</u>		<u>Prosperity</u>		
	Rural (1)	Urban (2)	Literate (3)	Illiterate (4)	High (5)	Low (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.019** (0.008)	-0.011 (0.032)	0.016 (0.012)	0.018** (0.008)	0.013 (0.014)	0.022*** (0.008)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	-0.002 (0.008)	-0.026 (0.033)	0.006 (0.010)	-0.004 (0.011)	-0.002 (0.011)	0.002 (0.012)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	-0.004 (0.006)	0.016 (0.036)	-0.006 (0.008)	-0.009 (0.008)	-0.006 (0.014)	-0.005 (0.008)
Observations	7,316	1,308	3,958	4,677	4,337	4,309
R-squared	0.160	0.281	0.205	0.181	0.171	0.159
Individual and household controls	✓	✓	✓	✓	✓	✓
Weather controls	✓	✓	✓	✓	✓	✓
District x Month of survey FE	✓	✓	✓	✓	✓	✓
District x Year of survey FE	✓	✓	✓	✓	✓	✓

**Table A4: The effects of climate shocks, by cohort, on women's attitudes towards IPV**

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to:					
	All (1)	Agriculture Dependent Communities (2)	Agriculture Dependent Communities (3)	Three lowest quintiles (4)	Two lowest quintiles (5)	Lowest quintile (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.001 (0.014)	0.005 (0.019)	-0.009 (0.022)	-0.015 (0.018)	-0.031 (0.020)	-0.068** (0.031)
No. of dry months x birth cohort 1960s	0.002 (0.014)	-0.001 (0.020)	0.005 (0.021)	0.022 (0.018)	0.033 (0.020)	0.080** (0.031)
No. of dry months x birth cohort 1970s	0.005 (0.013)	0.006 (0.019)	0.001 (0.021)	0.022 (0.017)	0.041** (0.020)	0.077** (0.030)
No. of dry months x birth cohort 1980s	0.005 (0.013)	0.004 (0.019)	0.003 (0.021)	0.024 (0.017)	0.044** (0.020)	0.093*** (0.030)
No. of dry months x birth cohort 1990s	0.004 (0.013)	0.006 (0.019)	-0.001 (0.020)	0.026 (0.017)	0.046** (0.020)	0.082*** (0.030)
Total effect for birth cohort 1960s	0.003	0.005	-0.005	0.008	0.002	0.012
p-value	[0.615]	[0.469]	[0.626]	[0.203]	[0.732]	[0.225]
Total effect for birth cohort 1970s	0.006	0.011**	-0.009	0.006	0.010	0.009
p-value	[0.233]	[0.036]	[0.311]	[0.171]	[0.100]	[0.252]
Total effect for birth cohort 1980s	0.005	0.009*	-0.007	0.010**	0.013**	0.025***
p-value	[0.233]	[0.076]	[0.440]	[0.043]	[0.020]	[0.002]
Total effect for birth cohort 1990s	0.004	0.012**	-0.010	0.011**	0.015**	0.015
p-value	[0.350]	[0.043]	[0.236]	[0.025]	[0.019]	[0.113]
Observations	27,085	17,703	8,657	27,085	17,703	8,657
R-squared	0.113	0.132	0.159	0.113	0.132	0.159
Cohort FE	✓	✓	✓	✓	✓	✓
Number of wet months x cohort	✓	✓	✓	✓	✓	✓
Number of hot months x cohort	✓	✓	✓	✓	✓	✓

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## The heterogeneous effects of climate shocks in agriculture

Dependent Variable: Justifies IPV for at least one reason

Sample restricted to:

	All (1)	Three lowest quintiles (2)	Two lowest quintiles (3)	Lowest quintile (4)
<b>Panel A: Sample restricted to &gt;= median employment share in agriculture</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010** (0.005)	0.010* (0.005)	0.014** (0.007)	0.031*** (0.010)
Observations	23,108	12,971	8,521	4,165
R-squared	0.118	0.116	0.132	0.164
<b>Panel B: Sample restricted to &lt; median employment share in agriculture</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	-0.008 (0.008)	0.005 (0.010)	0.007 (0.011)	0.010 (0.013)
Observations	22,608	12,966	8,444	4,132
R-squared	0.120	0.133	0.165	0.195
<b>Panel C: Considering climate vulnerability indices</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.004 (0.004)	0.007 (0.005)	0.009 (0.006)	0.013* (0.008)
Agricultural vulnerability index (upper quartile)	-0.010 (0.024)	-0.056** (0.028)	-0.051 (0.032)	-0.054 (0.041)
Number of dry months x agricultural vul. index	0.004 (0.003)	0.008* (0.004)	0.008* (0.005)	0.011* (0.006)
Total effect for upper quartile vulnerability	0.008	0.015	0.017	0.024
F-statistic	2.25	8.12	7.20	8.60
p-value	[0.134]	[0.004]	[0.007]	[0.003]

### The effects of climate shocks: Robustness checks

	Dependent Variable: Justifies IPV for at least one reason Sample restricted to:					
	Agriculture		Non-Agriculture			
	All	Dependent Communities	Dependent Communities	Three lowest quintiles	Two lowest quintiles	Lowest quintile
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A</b>						
Number of dry months (in logs)	0.028 (0.025)	0.064** (0.027)	-0.087 (0.053)	0.048* (0.027)	0.068** (0.031)	0.115*** (0.039)
Observations	47,885	23,108	22,608	27,085	17,703	8,657
R-squared	0.110	0.118	0.120	0.112	0.131	0.157
<b>Panel B</b>						
Number of dry months	0.018** (0.008)	0.033*** (0.009)	-0.014 (0.016)	0.020** (0.009)	0.024** (0.009)	0.038*** (0.014)
Years lived in same residence	0.001 (0.000)	0.001 (0.001)	0.000 (0.001)	0.001* (0.001)	0.001 (0.001)	0.002* (0.001)
Observations	17,214	8,461	7,970	9,856	6,534	3,253
R-squared	0.099	0.114	0.113	0.103	0.124	0.144
<b>Panel C</b>						
Number of dry months (second quartile)	0.035** (0.015)	0.027* (0.015)	-0.015 (0.024)	0.049*** (0.015)	0.045** (0.018)	0.065** (0.025)
Number of dry months (third quartile)	0.033 (0.022)	0.053** (0.025)	-0.025 (0.033)	0.048** (0.022)	0.044* (0.024)	0.103*** (0.035)
Number of dry months (fourth quartile)	0.034 (0.028)	0.059** (0.029)	-0.035 (0.046)	0.059** (0.026)	0.072** (0.033)	0.126*** (0.046)
Observations	47,885	23,108	22,608	27,085	17,703	8,657
R-squared	0.111	0.118	0.120	0.113	0.131	0.157

### The effects of climate shocks: Additional weather controls

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to:					
	All (1)	Agriculture- Dependent Communities (2)	Non-Agriculture- Dependent Communities (3)	Three lowest quintiles (4)	Two lowest quintiles (5)	Lowest quintile (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.005 (0.004)	0.010** (0.005)	-0.008 (0.008)	0.009** (0.004)	0.011** (0.005)	0.016** (0.007)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	-0.004 (0.004)	-0.002 (0.005)	0.002 (0.011)	-0.007 (0.005)	-0.004 (0.006)	0.000 (0.008)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	-0.002 (0.003)	-0.008* (0.004)	-0.002 (0.005)	-0.004 (0.004)	-0.007 (0.005)	-0.009 (0.007)
Solar radiation (past 3 years)	0.000 (0.000)	-0.000 (0.000)	0.000 (0.000)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Wind speed (past 3 years)	0.028 (0.036)	-0.068 (0.042)	0.045 (0.069)	0.009 (0.040)	0.006 (0.044)	-0.030 (0.050)
Vapor pressure (past 3 years)	-0.047** (0.023)	-0.005 (0.026)	-0.053 (0.057)	-0.045* (0.025)	-0.042 (0.026)	0.015 (0.032)
Observations	47,885	23,108	22,608	27,085	17,703	8,657
R-squared	0.111	0.118	0.120	0.113	0.131	0.157

### The effects of climate shocks on tolerance of IPV in agriculture

Dependent Variable: Justifies IPV for at least one reason

Sample restricted to:

	All (1)	Three lowest quintiles (2)	Two lowest quintiles (3)	Lowest quintile (4)
<b>Panel A: Sample restricted to agricultural households</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.016*** (0.006)	0.014** (0.006)	0.019*** (0.007)	0.028*** (0.010)
Observations	12,864	10,517	7,557	3,902
R-squared	0.127	0.132	0.154	0.198
<b>Panel B: Sample restricted to other households</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	-0.001 (0.005)	0.005 (0.006)	0.005 (0.008)	0.005 (0.011)
Observations	34,435	16,293	9,970	4,637
R-squared	0.115	0.124	0.151	0.195
<b>Panel C: Sample restricted to agricultural households and women are employed</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.005 (0.009)	-0.001 (0.010)	0.001 (0.012)	0.034* (0.018)
Observations	4,698	3,991	2,941	1,543
R-squared	0.158	0.166	0.194	0.240
<b>Panel D: Sample restricted to agricultural households and women are not employed</b>				
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.018** (0.007)	0.020*** (0.008)	0.026*** (0.010)	0.032** (0.016)
Observations	8,112	6,470	4,542	2,279
R-squared	0.142	0.151	0.174	0.220

**Table A3: Climate shocks and attitudes towards IPV: Heterogeneous effects**

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to: lowest quintile					
	Residence		Literacy		Prosperity	
	Rural (1)	Urban (2)	Literate (3)	Illiterate (4)	High (5)	Low (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.019** (0.008)	-0.011 (0.032)	0.016 (0.012)	0.018** (0.008)	0.013 (0.014)	0.022*** (0.008)
Number of wet months (past 3 years) (above 1 SD of historical average rainfall)	-0.002 (0.008)	-0.026 (0.033)	0.006 (0.010)	-0.004 (0.011)	-0.002 (0.011)	0.002 (0.012)
Number of hot months (past 3 years) (above 1 SD of historical average temperature)	-0.004 (0.006)	0.016 (0.036)	-0.006 (0.008)	-0.009 (0.008)	-0.006 (0.014)	-0.005 (0.008)
Observations	7,316	1,308	3,958	4,677	4,337	4,309
R-squared	0.160	0.281	0.205	0.181	0.171	0.159
Individual and household controls	✓	✓	✓	✓	✓	✓
Weather controls	✓	✓	✓	✓	✓	✓
District x Month of survey FE	✓	✓	✓	✓	✓	✓
District x Year of survey FE	✓	✓	✓	✓	✓	✓

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**Summary statistics for sub-districts with and without BCCT projects**

	<u>Non-BCCT</u>		<u>BCCT</u>		Difference (5)
	Mean (1)	Std. Dev (2)	Mean (3)	Std. Dev (4)	
<b>Social, economic, and geographic covariates</b>					
Nightlight (in logs)	1.527	1.235	1.216	0.681	0.311***
NDVI (in logs)	8.448	0.175	8.461	0.212	-0.013
Ground slope	0.347	0.762	0.223	0.244	0.124**
Elevation	21.657	32.903	15.157	14.124	6.500**
Population density	7.287	1.345	6.964	0.482	0.323***
Distance to coast (km)	163.650	112.120	136.517	118.178	27.133*
Distance to roads (km)	2.290	2.138	2.413	2.392	-0.122
Travel time to cities (mins)	101.166	75.717	130.702	95.187	-29.536**
PM 2.5	39.571	6.229	38.021	5.995	1.549**
Share of employment in agriculture	53.838	26.200	54.857	17.799	-1.019
Share of employment in manufacturing	11.232	10.213	10.492	8.268	0.741
Share of employment in services	34.931	19.415	34.652	14.046	0.279
Households with access to electricity (%)	53.293	25.536	52.639	20.346	0.654
Population aged 15 to 64 years (%)	60.719	5.908	59.464	3.916	1.256**
Households with no access to toilet (%)	8.276	9.903	7.001	7.923	1.275
<b>Climate change vulnerability indices</b>					
Population affected by natural disasters	0.464	0.092	0.511	0.091	-0.048***
Heat stress	0.382	0.061	0.382	0.062	0.000
Land availability for livestock	0.364	0.048	0.382	0.047	-0.018***
Water availability	0.573	0.063	0.544	0.077	0.029***
Crop yield availability	0.532	0.046	0.529	0.048	0.003
Decrease in livestock & poultry health	0.647	0.041	0.631	0.046	0.016***
Land availability for agriculture	0.557	0.113	0.572	0.094	-0.015
Change in fish culture	0.250	0.100	0.297	0.084	-0.047***
Change in fish capture	0.290	0.108	0.331	0.093	-0.041***
Rail network vulnerability	0.335	0.127	0.365	0.113	-0.030*
Road network vulnerability	0.352	0.081	0.389	0.060	-0.037***

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**Table A6: Climate shocks, attitudes towards IPV and BCCT projects**

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to:					
	All (1)	Agriculture- Dependent Communities (2)	Non-Agriculture- Dependent Communities (3)	Three lowest quintiles (4)	Two lowest quintiles (5)	Lowest quintile (6)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.005 (0.004)	0.011** (0.005)	-0.009 (0.008)	0.009* (0.005)	0.011** (0.006)	0.017** (0.007)
BCCT project (active before survey)	-0.008 (0.028)	0.062* (0.036)	-0.061 (0.065)	-0.019 (0.035)	-0.012 (0.041)	-0.014 (0.057)
Number of dry months x BCCT project	-0.002 (0.005)	-0.018** (0.008)	0.017 (0.015)	-0.001 (0.006)	-0.002 (0.008)	-0.005 (0.011)
Observations	47,885	23,108	22,608	27,085	17,703	8,657
R-squared	0.111	0.118	0.120	0.113	0.131	0.157

### Climate shocks, attitudes towards IPV and BCCT projects

	Dependent Variable: Justifies IPV for at least one reason					
	Sample restricted to: lowest quintile					
	respondent works in agriculture	resp. or husband in agriculture	husband in agric. and resp. works in any sector	respondent works in agriculture	resp. or husband in agriculture	husband in agric. and resp. works in any sector
	(1)	(2)	(3)	(4)	(5)	(6)
<b>Panel A</b>						
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.026*	0.022*	0.040**	0.023	0.020	0.040**
	(0.014)	(0.013)	(0.018)	(0.014)	(0.013)	(0.019)
BCCT project (active before survey)	0.135*	0.111	0.146			
	(0.070)	(0.071)	(0.113)			
Number of dry months x BCCT project	-0.046***	-0.038***	-0.042**			
	(0.013)	(0.013)	(0.020)			
Number of BCCT projects				0.052	0.034	0.121
				(0.041)	(0.047)	(0.080)
Number of dry months x num of BCCT projects				-0.022**	-0.018*	-0.032*
				(0.010)	(0.010)	(0.017)
Joint test:						
num. of dry months + (num. of dry months x BCCT) = 0	-0.021	-0.016	-0.002	0.001	0.003	0.001
F-statistic	1.560	0.960	0.010	0.000	0.030	0.170
p-value	[0.212]	[0.328]	[0.937]	[0.952]	[0.859]	[0.677]
Observations	2,470	2,800	1,543	2,470	2,800	1,543
R-squared	0.194	0.199	0.241	0.193	0.198	0.241

**Climate shocks, attitudes towards IPV and BCCT projects**

Dependent Variable: Justifies IPV for at least one reason			
Sample restricted to:			
Respondents in agriculture-dependent communities			
	Three lowest quintiles (1)	Two lowest quintiles (2)	Lowest quintile (3)
<b>Panel A: With pre-BCCT covariates</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.011** (0.005)	0.012* (0.006)	0.024*** (0.009)
BCCT project (active before survey)	0.086** (0.041)	0.045 (0.045)	0.110 (0.070)
Number of dry months x BCCT project	-0.021** (0.009)	-0.021** (0.010)	-0.040*** (0.014)
Observations	16,954	11,889	6,145
R-squared	0.120	0.136	0.161
<b>Panel B: Only projects still active</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010* (0.005)	0.010* (0.006)	0.021** (0.008)
BCCT project (active at survey)	0.067 (0.041)	0.025 (0.048)	0.054 (0.074)
Number of dry months x BCCT project	-0.020** (0.008)	-0.021** (0.010)	-0.033** (0.014)
Observations	16,954	11,889	6,145
R-squared	0.118	0.134	0.159
<b>Panel C: No projects in survey year</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010** (0.005)	0.011* (0.006)	0.022*** (0.008)
BCCT project (active before survey)	0.117*** (0.043)	0.092* (0.047)	0.130 (0.080)
Number of dry months x BCCT project	-0.027*** (0.009)	-0.029*** (0.010)	-0.043*** (0.016)
Observations	16,954	11,889	6,145
R-squared	0.118	0.134	0.159

**Climate shocks, attitudes towards IPV and BCCT projects: Nearest-neighbor matching estimator results**

	Dependent Variable: Justifies IPV for at least one reason Sample restricted to: Respondents in agriculture-dependent communities			
	(1)	(2)	(3)	(4)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.017 (0.013)	0.014 (0.013)	0.016 (0.012)	0.013 (0.013)
BCCT project (active before survey)	-0.008 (0.060)	-0.020 (0.062)		
Number of dry months x BCCT project	-0.008 (0.013)	-0.006 (0.013)		
Inactive BCCT project (active after survey)		-0.090 (0.086)		
Number of dry months x inactive BCCT project		0.011 (0.012)		
Number of BCCT projects		0.000 (0.047)	-0.007 (0.048)	
Number of dry months x num of BCCT projects		-0.006 (0.011)	-0.005 (0.011)	
Number of inactive BCCT projects			-0.065 (0.064)	
Number of dry months x num of inactive projects			0.008 (0.009)	
Observations	4802	4802	4802	4802
R-squared	0.189	0.190	0.189	0.190

**BCCRF's projects**

Projects	Objectives	Achievements (end of reporting period, 2016)	Achievements in 2012
(1) The Emergency 2007 Cyclone Recovery and Restoration Project (ECRRP)	Improve climate resilience of coastal populations to tropical cyclones	Full implementation targets met by end of 2015. Construction of 61 cyclone shelters; 11.5 km of access road.	Approved in May 2011; grant of \$25 million; activities to start in 2012
(2) The BCCRF Secretariat	To improve the Ministry's capacity to manage climate change activities through a secretariat	Project completed on schedule as planned.	Establishment approved in February 2011; grant of \$0.2 million in November 2011
(3) The Community Climate Change Project (CCCP)	Increase climate change resilience of selected communities by enhancing capacity	41 NGO executed projects, all completed. All targets met or exceeded; involving community-based efforts.	Allocation of \$12.5 million in June 2011; grant agreement signed in early 2012
(4) The Climate Resilient Participatory Afforestation and Reforestation Project (CRPAPR)	Reduce forest degradation; increase forest coverage; build long-term resilience in selected coastal and hilly communities	17,500 ha of land restored or reforested; 2000 kms of strip plantations established; 3.6 million workdays of community jobs, more than 60,000 direct beneficiaries.	Approved in April 2011; Grant agreement of \$33.8 million signed in 2012; activities to begin shortly after
(5) The Rural Electrification and Renewable Energy Development Project II (RERED II)	Increase access to clean energy in rural areas; use of renewable energy; promote more efficient energy consumption	489 solar irrigation pumps; 35,062 acres covered, and 11,453 farmers directly impacted; met 100% of coverage target	Approved in September 2012; grant of \$10 million

Source: Authors' compilation from the official BCCRF Annual Reports, 2011-2016, Washington, D.C.: World Bank Group.

**Climate shocks, attitudes towards IPV and BCCT Projects (Robustness)**

Dependent Variable: Justifies IPV for at least one reason

Sample restricted to:  
 Respondents in agriculture-dependent  
 communities

	Three lowest quintiles (1)	Two lowest quintiles (2)	Lowest quintile (3)
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010* (0.005)	0.011* (0.006)	0.022*** (0.008)
BCCT project (active before survey)	0.081* (0.048)	0.045 (0.054)	0.042 (0.080)
Number of dry months x BCCT project	-0.024** (0.009)	-0.022** (0.011)	-0.029** (0.015)
Joint test:			
num. of dry months + (num. of dry months x BCCT) = 0	-0.013	-0.011	-0.008
F-statistic	1.88	0.95	0.25
p-value	[0.171]	[0.331]	[0.619]
Observations	16,522	11,560	5,977
R-squared	0.119	0.135	0.160

**Table A10: Climate shocks, attitudes towards IPV and BCCT projects**

Dependent Variable: Justifies IPV for at least one reason

	Sample restricted to:		
	Respondents in agriculture-dependent communities		
	Three lowest quintiles (1)	Two lowest quintiles (2)	Lowest quintile (3)
<b>Panel A: With pre-BCCT covariates</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.011** (0.005)	0.012* (0.006)	0.024*** (0.009)
BCCT project (active before survey)	0.086** (0.041)	0.045 (0.045)	0.110 (0.070)
Number of dry months x BCCT project	-0.021** (0.009)	-0.021** (0.010)	-0.040*** (0.014)
Observations	16,954	11,889	6,145
R-squared	0.120	0.136	0.161
<b>Panel B: Only projects still active</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010* (0.005)	0.010* (0.006)	0.021** (0.008)
BCCT project (active at survey)	0.067 (0.041)	0.025 (0.048)	0.054 (0.074)
Number of dry months x BCCT project	-0.020** (0.008)	-0.021** (0.010)	-0.033** (0.014)
Observations	16,954	11,889	6,145
R-squared	0.118	0.134	0.159
<b>Panel C: No projects started in survey year</b>			
Number of dry months (past 3 years) (below 1 SD of historical average rainfall)	0.010** (0.005)	0.011* (0.006)	0.022*** (0.008)
BCCT project (active before survey)	0.117*** (0.043)	0.092* (0.047)	0.130 (0.080)
Number of dry months x BCCT project	-0.027*** (0.009)	-0.029*** (0.010)	-0.043*** (0.016)
Observations	16,954	11,889	6,145
R-squared	0.118	0.134	0.159

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### জলবায়ু পরিবর্তন ট্রান্স ফাউন্ডের অর্থায়নে সমাষ্টকৃত প্রকল্পের তালিকাঃ

Serial No.	Project ID	Project Title	Implementing Agency	Approved Estimated Cost (TB)
1	2	জলবায়ু পরিবর্তনের বিরুদ্ধ প্রভাব মোকাবেলায় সারাদেশব্যাপী বালক বনায়নের লক্ষ্যে চারা উত্তোলন	Department of Forests	1,578.00
2	4	জলবায়ু পরিবর্তন মোকাবিলায় খরাপ্রক্রিয় ও উপকূলীয়/ লবণ্যাঞ্চ এলাকার জন্য টেকনিই ফলস ব্যবস্থা উন্নয়ন	Bangladesh Agricultural Research Institute (BARI)	600.00
3	5	Risk reduction and adaptive measures in the context of Climate Change impact on health sector in Bangladesh.	Health promotion and Climate Change unit, Ministry of Health and Family Welfare	1,811.66
4	6	জলবায়ু পরিবর্তন মোকাবেলায় উচ্চতা এবং দূরব্যাঙ্গ সহিত বিভিন্ন ক্ষসেবের মিউটেইন্স/জাহাজ বাছাই এবং চাষাবাদের পাইলাইন কমসূচী	Bangladesh Institute of Nuclear Agriculture (BINI)	488.00
5	7	Farm Productivity and Food security Enhancement of the Vulnerable Farmers in the Char Areas of Jamalpur and Sherpur Districts	Bangladesh Agricultural Research Institute (BARI)	107.60
6	8	খুলনা বিভাগের আইলা বিধান জেলাসমূহে দুর্বিশৱ সহনীয় গৃহ নির্মাণ	Department of Relief and Rehabilitation	2,498.64
7	9	বরিশাল বিভাগের আইলা বিধান জেলাসমূহে দুর্বিশৱ সহনীয় গৃহ নির্মাণ	Department of Relief and Rehabilitation	2,489.64
8	10	বরিশাল, খুলনা ও ঢাক্কায় বিভাগের আইলা বিধান জেলাসমূহের চৰ এলাকায় দুর্বিশৱ সহনীয় গৃহ নির্মাণ	Department of Relief and Rehabilitation	2,489.64
9	11	গুড়িগাঁও ও তুরাপ নদীতে সঞ্চিত পালিঝিনসহ অন্যান্য বর্জ অপসারণ	Bangladesh Inland Water Development Authority	2,243.00
10	12	বাগমারা হতে (থোকাবাটা লক্ষ্যাটি, কচুয়া বাজার ও আদাজুড়ি হয়ে) দেশভাড়া পর্যট মরা বসেক্ষণী নদী ঘনন	Bangladesh Water Development Board	850.00
11	13	জলবায়ু পরিবর্তন ট্রান্স ফাউন্ডের অর্থায়নে ঢাক্কায় জেলার রাঙ্গুনিয়া ও দেবালম্বণী উপজেলার পানি প্রবাহ সমস্যা সমাপ্ত প্রকল্প	Local Government Engineering Department	500.00
12	14	ঢাক্কায় জেলার রাঙ্গুনিয়া উপজেলারী কর্মসূচী সেচ প্রকল্প (ইহামতি ইউনিট) এবং আগতায় কর্মসূচী নদীর বামভৌমের সরকারিটা, আঠতীরে মরিয়ে নদীর ও বেগতারী, এবং ইহামতি নদীর বামভৌমের পক্ষিম শাঠি-নিকেতন ও ভানতীয়ের উপর পার, পূর্ব সাহারীনগর-গোয়াজুড়া ইঞ্জিন ভাগেন কর্মসূচিত	Bangladesh Water Development Board	2,100.00

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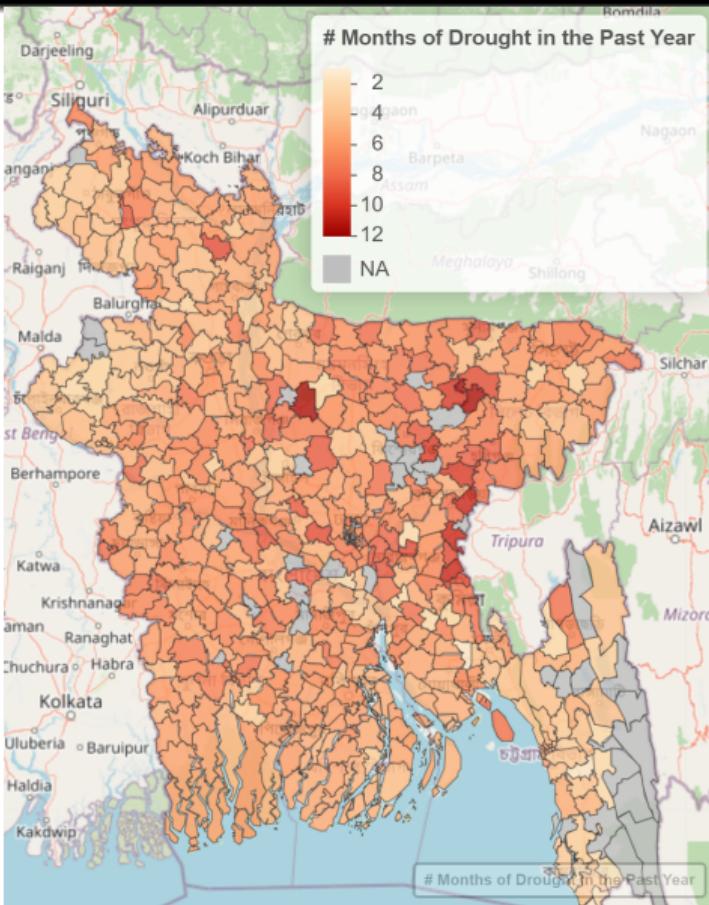
# Sample LLM-based classification of BCCT Projects

- ▶ Sustainable Agriculture:
  - ▶ Innovation of sustainable crop systems for drought-prone and coastal/saline areas to combat climate change
  - ▶ Farm Productivity and Food security Enhancement of the Vulnerable Farmers in the Char Areas of Jamalpur and Sherpur Districts
- ▶ Water Management:
  - ▶ Protective and infrastructure construction work in various erosion-prone parts of Karnaphuli, Halda, Ichamati rivers and Shilok canal and their branches in different upazilas of Chittagong district
  - ▶ Development of irrigation and communication systems in coastal areas of Mirsharai Upazila, Chittagong District, and upgrading of CDSP embankment in Muhuri accreted area
- ▶ Disaster Resilience:
  - ▶ Addition of brick walls and doors-windows around cyclone-resilient houses built in Aila-affected districts of Barisal and Khulna divisions

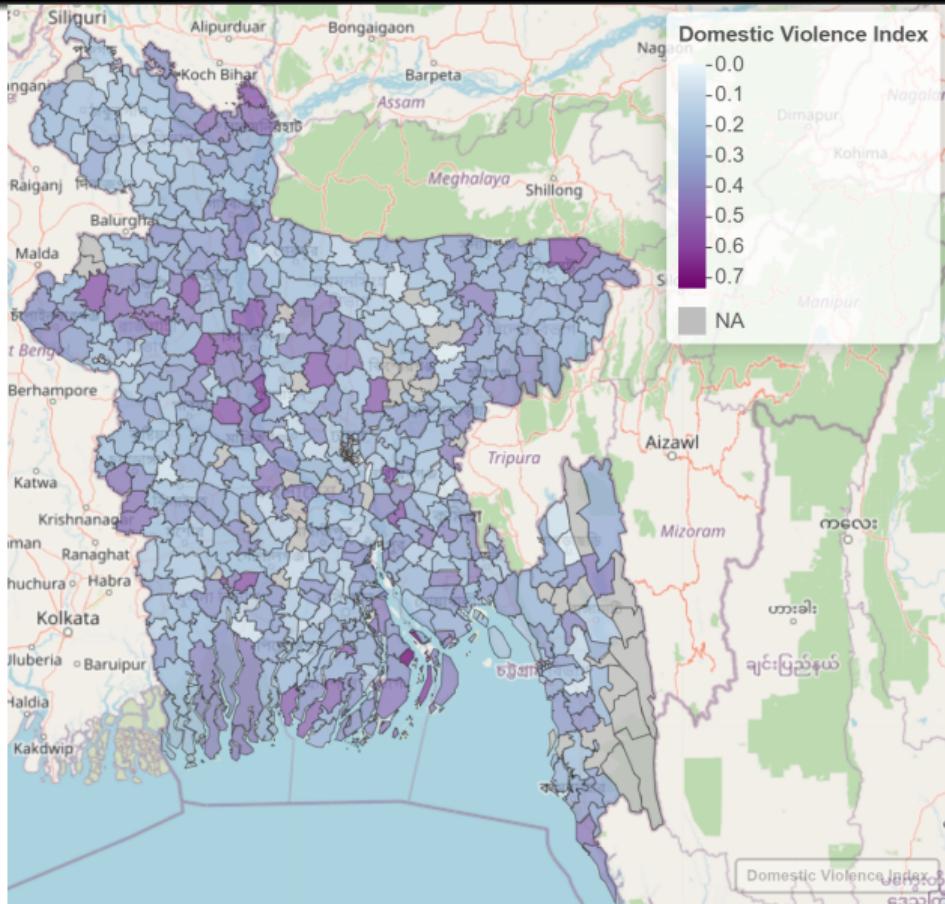
## Sample LLM-based classification of BCCT Projects (Cont.)

- ▶ Renewable Energy
  - ▶ Electrification in local area (Upazila Complex) by using Solar Energy
  - ▶ Introduction of Solar Powered irrigation pump as well as Power management and Distribution system to mitigate energy Crisis and Climate Change
- ▶ Rural Livelihood Protection
  - ▶ Safe drinking water supply and social protection for women and children in adverse environments extremely threatened by climate change
  - ▶ Poverty alleviation and ensuring livelihood security through environmental conservation and management
- ▶ Urban Infrastructure:
  - ▶ Construction of RCC primary drain and installation of solar-powered street lights with poles in Hathazari municipal area to address climate change impacts.
  - ▶ Infrastructural development project in Nalchiti Pourashava to address climate change impacts.

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