

Breaking the Climate–Poverty Transmission Pathway: A Theory of Developmental Translation, Early Childhood Resilience and Research–Practice Partnership

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Article Info

E-ISSN: 3107-7129
Volume: 02
Issue: 06
Received: 12-09-2026
Accepted: 10-10-2026
Published: 08-11-2026
Page No: 51-59

Abstract

Climate vulnerability is increasingly recognized as a development problem, yet the mechanisms through which recurrent climate and livelihood pressures become embedded in childhood developmental trajectories and contribute to the reproduction of poverty remain insufficiently integrated across theoretical traditions. This article develops a theoretical framework linking climate vulnerability, early childhood development, intergenerational poverty, resilience and research–practice partnerships. The framework introduces Climate-Developmental Translation to explain how recurrent environmental and livelihood pressures are transmitted through household buffering, caregiving and early childhood development systems into accumulated constraints on children's capabilities and subsequent life-course opportunities. It then introduces Partnership-Mediated Interruption to explain how sustained research–practice partnerships may modify this transmission pathway through genuine co-production, contextualized knowledge, capability strengthening, adaptive practice and institutional learning. Developmental buffering provides the principal process through which successful interruption may protect children's developmental opportunities, while early childhood resilience is conceptualized as an emergent condition rather than an intrinsic characteristic of the child. The theory specifies ten propositions and identifies exposure persistence, household buffering, developmental and caregiving conditions, partnership integrity, contextual knowledge fit, gendered resource distribution and institutional capacity as important boundary conditions. The framework contributes to development theory by connecting environmental vulnerability with developmental accumulation and intergenerational poverty while identifying research–practice collaboration as a conditional mechanism for interrupting this pathway. It provides a basis for longitudinal, comparative and mixed-method research examining how climate vulnerability is translated into developmental disadvantage and under what conditions collaborative action can strengthen developmental resilience.

DOI: https://doi.org/10.54660/.IJHSI.2026.2.6.51-59

Keywords: climate vulnerability, early childhood development, intergenerational poverty, developmental resilience, research–practice partnerships, capability, co-production, climate adaptation, Global South

1. Introduction

Climate vulnerability is increasingly experienced not only as an environmental problem but as a problem of development. Recurrent drought, flooding, heat, water insecurity, livelihood disruption and related environmental pressures can interact with poverty and limited institutional capacity to constrain household well-being and future opportunities. These consequences are particularly important during childhood because environmental and livelihood pressures can enter the developmental environments in which nutrition, caregiving, protection and early learning occur.

Climate exposure, however, should not be treated as synonymous with developmental disadvantage. Vulnerability depends on the interaction among exposure, sensitivity, resources, adaptive capacity and wider social and institutional conditions (O'Brien *et al*., 2007) [10]. Households experiencing similar environmental pressures may therefore experience substantially different consequences. Agency, capacity and resilience influence how environmental change is absorbed, negotiated and transformed into consequences for well-being (Brown & Westaway, 2011) [4].

Recent evidence increasingly demonstrates the relevance of these processes to children. Noor *et al*. (2026) [8], synthesizing evidence from 29 primary studies across 18 countries, show that climate-related exposures can affect the learning and development of children and youth living in poverty through pathways involving household and caregiver pressures, disruption of learning environments and unequal institutional capacity.

The developmental significance of childhood is well established. Early childhood represents a critical period of capability formation, with developmental conditions influencing subsequent human-capital formation, educational attainment and inequality (Black *et al*., 2017; Attanasio *et al*., 2022) [1, 2]. These processes also have implications for poverty because childhood conditions can influence life-course opportunities and the possibility of poverty persisting across generations (Harper *et al*., 2003; McEwen & McEwen, 2017) [6, 7].

Yet the theoretical literatures explaining these relationships remain partly differentiated. Climate vulnerability scholarship emphasizes exposure, vulnerability and adaptive capacity. Early childhood scholarship focuses on developmental environments and capability formation. Life-course and intergenerational poverty scholarship addresses the accumulation and transmission of disadvantage. Resilience theory emphasizes adaptation and recovery under adversity. Research–practice partnership scholarship examines sustained collaboration between researchers and practitioners, including co-production, research use and contextualized knowledge (Coburn & Penuel, 2016; Sjölund *et al*., 2022) [5, 12].

The problem is therefore not the absence of evidence connecting these domains. Rather, it is the insufficient specification of the mechanism connecting them. Climate exposure does not automatically become developmental disadvantage, and developmental disadvantage does not automatically become intergenerational poverty. Between these outcomes lie household, caregiving, capability and institutional processes through which environmental stress may be absorbed, translated, buffered or accumulated.

This article addresses that theoretical problem by introducing Climate-Developmental Translation, defined as the process through which recurrent climate and livelihood pressures become embedded in household, caregiving and early-childhood systems, producing persistent differences in children's developmental capabilities and subsequent life-course opportunities.

The second question concerns interruption. If climate vulnerability can become developmentally consequential through household and institutional processes, those processes may also provide potential points of intervention. Research–practice partnerships are particularly relevant because they are designed around sustained collaboration, reciprocal learning, practitioner engagement and the production and use of knowledge in context. Existing RPP scholarship establishes important conditions associated with effective partnerships but does not establish that RPPs necessarily reduce climate-related developmental disadvantage or intergenerational poverty (Coburn & Penuel, 2016; Sjölund *et al*., 2022) [5, 12].

Building on this literature, this article theorizes Partnership-Mediated Interruption as the process through which sustained research–practice collaboration modifies the knowledge, capability and institutional conditions through which climate vulnerability is translated into developmental disadvantage.

The framework also distinguishes developmental buffering from early childhood resilience. Developmental buffering refers to the processes through which household, community and institutional systems protect children's developmental opportunities under conditions of adversity. Resilience is consequently treated as an emergent developmental condition rather than an intrinsic characteristic of the child.

The article makes three principal contributions. First, it specifies a mechanism through which recurrent climate vulnerability can become developmental disadvantage. Second, it connects environmental vulnerability with developmental accumulation and life-course processes associated with intergenerational poverty. Third, it extends research–practice partnership theory by conceptualizing sustained collaboration as a conditional mechanism for interrupting a climate-linked developmental transmission pathway.

The framework generates ten theoretical propositions and specifies four interconnected clusters of boundary conditions: exposure and household conditions; developmental and caregiving conditions; partnership conditions; and structural and institutional conditions.

The theoretical problem becomes especially consequential in settings where climatic variability is recurrent, livelihood systems are climate-sensitive, public services are unevenly distributed, and households must continuously negotiate competing demands for food, income, care and education. In such settings, the developmental effects of climate stress are unlikely to be adequately represented by a simple exposure–outcome relationship. The same rainfall deficit, heat episode or livelihood disruption can produce different developmental consequences depending on whether households possess assets that can be mobilized, whether caregivers can maintain time for responsive interaction, whether basic services remain accessible, and whether institutions can adapt to changing needs. Climate vulnerability is therefore better understood as a relational condition in which environmental pressures encounter unequal capacities to absorb, convert and respond. This perspective is particularly important for development theory because vulnerability is often measured at one level while consequences are observed at another. Climate indicators may be spatially aggregated, household vulnerability may be measured through assets or income, and developmental outcomes may be observed in individual children. Without an explicit translation mechanism, the analytical link between these levels remains underspecified. The present framework addresses this cross-level problem by asking what has to occur between environmental exposure and developmental consequence. It proposes that climate stress becomes developmentally consequential when it disrupts the material, temporal, relational and institutional conditions that sustain developmental environments, and

when those disruptions recur sufficiently to constrain recovery and capability formation.

The argument also avoids two symmetrical errors. The first is environmental determinism: assuming that exposure necessarily produces developmental harm. The second is an overly individualized account of resilience: assuming that children can be considered resilient independently of the households, communities and institutions that organize their developmental environments. By locating translation and buffering within interacting systems, the framework treats children's developmental opportunities as socially produced and potentially modifiable. This makes the theory compatible with capability approaches, ecological perspectives and life-course thinking while adding a more explicit account of how recurrent environmental pressure enters those systems.

The article is also deliberately attentive to context. Climate-vulnerable regions are not homogeneous, and interventions developed around standardized assumptions may not fit differences in livelihood systems, gendered responsibilities, institutional reach, cultural practice or locally available knowledge. The framework therefore treats contextual fit as a theoretical condition rather than an implementation afterthought. Local and Indigenous knowledge may contribute to adaptive capacity, but their contribution depends on whether knowledge is recognized, combined with relevant scientific and institutional resources, and converted into workable practice. Similarly, research–practice partnership is not treated as a universal solution; its interruptive potential depends on the quality of relationships, the distribution of decision-making power, the capacity of actors to act on knowledge, and the institutional conditions that sustain change.

3. Climate-Developmental Translation

2. Conceptual Foundations

The framework brings together five bodies of scholarship that are often discussed separately: climate vulnerability, human development and capabilities, early childhood development, resilience and life-course/intergenerational poverty, and research–practice partnerships. The purpose is not to collapse these traditions into a single construct, but to identify the missing processual links among them. Each tradition contributes a necessary part of the explanation. Climate vulnerability identifies exposure and differentiated sensitivity; capability theory directs attention to the conversion of resources into substantive opportunities; ecological approaches locate children within nested relational environments; resilience perspectives emphasize adaptation and continuity under adversity; and life-course approaches emphasize accumulation and the persistence of disadvantage. Research–practice partnership scholarship adds a relational account of how knowledge may be jointly produced and converted into practice. The theoretical contribution lies in specifying how these elements can interact over time.

A capability perspective is particularly useful because resources do not automatically become developmental opportunities. A household may possess land, livestock, social connections, information or access to services without being able to convert those resources into stable nutrition, responsive caregiving, early learning or protection. Conversion depends on constraints and enabling conditions that include time, health, gendered responsibilities, institutional access, social norms and the suitability of available knowledge. This distinction prevents the theory from equating household resources with developmental protection. Buffering is consequently conceptualized as a conversion process through which available resources and capabilities are mobilized to preserve developmentally important functions during disruption.

The ecological perspective adds a second necessary distinction: developmental environments are nested. Climate-related pressures may originate outside the household but can enter children's lives through food prices, water availability, parental time, livelihood demands, service disruption, migration, stress and altered community support. Conversely, institutions can partially insulate households from environmental stress through social protection, health, education, nutrition and other services. The developmental consequence of climate exposure therefore depends partly on the integrity of the connections among levels. This is why the theory does not assign causal priority to a single household variable or institutional actor.

Early childhood is treated as a sensitive period not because all children exposed to adversity will experience lasting harm, but because developmental capabilities are being formed and consolidated while dependence on caregivers and basic services is relatively high. Disruption during this period can affect the continuity and quality of interactions through which learning, social competence, health and agency develop. The theory therefore emphasizes developmental conditions rather than an abstract notion of childhood vulnerability. What matters is whether environmental stress alters the actual conditions through which capabilities are formed, maintained and recovered.

Resilience is similarly reframed. Rather than locating resilience primarily inside the child, the framework asks whether systems surrounding the child can absorb disruption while preserving essential developmental functions. This does not deny children's agency or variation in response. Instead, it places individual capacities within the conditions that enable or constrain their expression. Developmental resilience can thus emerge when buffering processes maintain continuity, restore disrupted functions and prevent temporary shocks from becoming cumulative developmental constraints.

Finally, research–practice partnerships are positioned as a possible mechanism of interruption rather than as an intervention category that is inherently beneficial. Their relevance derives from the possibility that sustained collaboration can alter how problems are defined, how evidence is interpreted, how local knowledge is incorporated, and how capabilities are built for action. The key theoretical question is consequently not whether researchers and practitioners interact, but whether interaction changes the conversion conditions that determine what actors can do. This distinction underpins Partnership-Mediated Interruption and links partnership integrity to developmental buffering without assuming that partnership activity automatically generates developmental improvement.

Climate-Developmental Translation is the central reproductive mechanism of the theory.

The mechanism begins with climate-structural vulnerability and recurrent exposure. Exposure may produce household and livelihood disruption, but the magnitude and persistence of disruption depend on household buffering and recovery capacity.

The central sequence is: climate vulnerability → recurrent exposure → household/livelihood disruption → caregiving

and ECD constraints → child capability constraints → accumulated developmental disadvantage → constrained life-course opportunities → increased risk of intergenerational poverty.

This sequence is explicitly non-deterministic. Climate exposure is not equivalent to household disruption. Household disruption is not equivalent to developmental disadvantage. Developmental disadvantage is not equivalent to intergenerational poverty.

Translation occurs when recurrent climatic and livelihood pressures constrain the resources, time, stability and institutional conditions required to maintain effective caregiving, nutrition, protection and early learning.

The importance of repetition is central. A single shock may be absorbed without substantial developmental consequences. Recurrent shocks, especially where recovery is incomplete, can progressively weaken the capacity of households and surrounding systems to maintain developmental conditions.

Capability conversion provides another important part of the mechanism. Material resources, knowledge and services only become developmental opportunities through processes of conversion shaped by household conditions, institutional access, gendered decision-making and contextual fit (Sen, 1999; Nussbaum, 2011) [9, 11].

The mechanism recognizes children as situated within relational systems rather than as isolated recipients of climate impacts. Bronfenbrenner's (1979) [3] ecological perspective is particularly useful here because development occurs through nested and interacting environments.

Gender is treated as a conditioning structure. The distribution of resources, responsibilities, time and decision-making within households can affect both exposure consequences and the capacity to implement adaptive responses.

The mechanism also has an important temporal asymmetry. Household and institutional decisions made in response to immediate stress may be rational in the short term while carrying developmental costs over longer periods. For example, reallocating caregiver time toward income-generating activity can protect household consumption while reducing opportunities for interaction with a young child. Similarly, withdrawing from a service because transport or fees become unaffordable may conserve resources immediately but reduce developmental support. Climate-Developmental Translation therefore does not imply that households make maladaptive choices; it highlights how constrained choices can redistribute costs across time and across members of the household.

Recurrence is not defined simply as the number of shocks. What matters theoretically is the relationship between disruption and recovery. A sequence of shocks can become cumulative when each new disturbance arrives before households or institutions have restored essential functions. Conversely, frequent but relatively well-buffered disturbances may have limited developmental consequences. This introduces a recovery-dependent dimension to Climate-Developmental Translation: persistence arises when the demands generated by exposure exceed the capacity of systems to restore developmental conditions. The mechanism therefore accommodates both deterioration and recovery and can explain why apparently similar climate histories produce divergent developmental trajectories.

The translation mechanism can be understood as a sequence of transformations rather than a single causal effect. Environmental pressure first encounters an exposed livelihood and household system. The resulting disruption then affects the allocation of scarce resources, including money, food, labour and time. These reallocations can alter caregiving routines and access to developmental services. Where disruption persists, the developmental environment may become less stable, reducing opportunities for stimulation, protection, nutrition and learning. Only through these intermediate processes does an environmental shock become developmentally consequential. The theory therefore predicts heterogeneity even under comparable climatic exposure because households differ in their conversion conditions and in the institutional environments surrounding them.

Propositions

P1. Recurrent climate vulnerability increases the likelihood and persistence of household and livelihood disruption, with the magnitude of disruption conditioned by household buffering capacity.

P2. The conversion of climate-related household disruption into developmental disadvantage is conditioned by the capacity of households and surrounding institutions to maintain caregiving, nutrition, protection and early learning conditions.

P3. Climate-developmental translation occurs when recurrent climatic and livelihood pressures constrain the resources, time, stability and institutional conditions required for effective caregiving and early childhood development.

P4. Repeated developmental constraints are more likely than isolated climate-related disruptions to generate persistent reductions in children's developmental capabilities because recurrent exposure can accumulate across sensitive developmental periods.

P5. Persistent childhood capability constraints increase the likelihood of constrained life-course opportunities and, consequently, the reproduction of poverty across generations.

4. Partnership-Mediated Interruption

Partnership-Mediated Interruption is the central counter-mechanism.

The mechanism begins with genuine co-production rather than one-way knowledge transfer.

The proposed sequence is: research–practice partnership → co-production → contextualized knowledge → capability strengthening → adaptive practice → institutional learning → Partnership-Mediated Interruption.

Co-production alone is insufficient. The relevant theoretical question is whether knowledge is converted into capabilities and whether those capabilities become adaptive practice.

Partnership integrity therefore includes sustained reciprocity, shared problem definition, joint decision-making, contextual knowledge, adaptive implementation and institutional uptake.

The mechanism may operate at multiple levels. Caregivers may alter practices; practitioners may modify service delivery; communities may reorganize local responses; and institutions may adapt procedures and resource allocation.

The theory does not claim that RPPs eliminate climate hazards. Nor does it assume that collaboration automatically produces developmental resilience. Instead, RPPs provide a potential mechanism for changing the conditions under which environmental stress is translated into developmental disadvantage.

The concept also introduces a power dimension. Co-production cannot be inferred from the physical presence of multiple actors in a project. Participation may coexist with unequal authority over problem definition, evidence recognition, resource allocation and implementation. Partnership integrity consequently requires attention to whose knowledge is considered legitimate, who decides which problems matter, and who controls the resources required to act. This is particularly important where communities have historically been positioned as recipients of externally defined solutions. Partnership-Mediated Interruption is strongest when collaboration changes not only information flows but also the practical capacity and decision space of actors responsible for developmental protection.

Interruption can occur at different points in the reproductive pathway. Partnerships may help actors anticipate exposure, protect livelihoods, maintain services, improve caregiving practices, or reorganize institutional responses after disruption. The mechanism is therefore not tied to a single intervention. Its distinctive feature is the conversion of collaboratively generated knowledge into altered capabilities and practices that change the conditions of translation. A partnership that produces reports without changing capabilities has weak interruptive potential; a partnership that changes practice but cannot sustain institutional support may produce only temporary interruption. Durability is therefore part of the theoretical mechanism rather than an optional outcome.

Propositions

P6. Research–practice partnerships are more likely to produce developmental interruption when problem definition, knowledge production, decision-making and implementation are genuinely co-produced among researchers, practitioners and relevant community actors.

P7. The effect of research–practice partnerships on developmental buffering is mediated by the conversion of co-produced knowledge into caregiver, practitioner and institutional capabilities and subsequently into adaptive practice.

P8. Research–practice partnerships operating across interconnected household, community and institutional levels are more likely to interrupt Climate-Developmental Translation than partnerships operating at a single level when the developmental pathway itself spans multiple levels.

5. Developmental Buffering and Early Childhood Resilience

Developmental buffering is the principal process connecting interruption to developmental outcomes. It refers to the processes through which household, community and institutional systems protect children's developmental opportunities under conditions of recurrent adversity.

The distinction between buffering and resilience is important. Buffering is a process. Resilience is an emergent condition. The framework therefore avoids treating resilience as a stable personal characteristic of the child.

Buffering may involve continuity of caregiving, nutrition, health, protection and early learning despite environmental disruption. It may also involve community support, institutional adaptation and continuity of essential services.

Developmental buffering differs from general climate adaptation. A household may adapt its livelihood without protecting children's developmental opportunities. Conversely, an ECD system may adapt service delivery while underlying household vulnerability remains unchanged.

The relevant outcome is therefore whether adaptation protects or restores developmental capabilities.

Successful Partnership-Mediated Interruption is expected to strengthen buffering when collaborative knowledge can be converted into capabilities and sustained adaptive practices.

The conceptual relationship is: Partnership-Mediated Interruption → developmental buffering → protected developmental opportunities → early childhood resilience/capability → altered life-course trajectory.

The strength of this relationship remains conditional on household, gendered, institutional and contextual circumstances.

Early childhood resilience, in this framework, is not synonymous with absence of adversity. A child may experience environmental disruption and nevertheless maintain developmental opportunities when surrounding systems provide continuity and recovery. Resilience is therefore relational and emergent: it becomes visible in the preservation or restoration of developmental capability under conditions that could otherwise erode it. This formulation also makes resilience compatible with inequality because buffering resources are not necessarily distributed equally within households or communities.

Developmental buffering should therefore be evaluated functionally rather than by the mere presence of an adaptation activity. The relevant question is whether essential developmental processes remain sufficiently continuous or recover sufficiently quickly after disruption. This distinction matters because an adaptation can succeed according to livelihood criteria while failing according to developmental criteria. Conversely, a relatively modest institutional adjustment may have substantial developmental value if it preserves access to nutrition, health, protection or responsive caregiving during a period of stress. Buffering is consequently an outcome-relevant process whose effectiveness depends on what it protects, for whom, and for how long.

6. Boundary Conditions

Exposure and household conditions include recurrent or persistent exposure, household buffering capacity, and recovery from previous disruption.

Developmental and caregiving conditions include developmental sensitivity, caregiving capacity, and continuity of ECD, health, nutrition and related services.

Partnership conditions include partnership integrity, genuine co-production, capability conversion, partnership continuity and contextual knowledge fit.

Structural and institutional conditions include institutional capacity, institutional uptake, and gendered distributions of resources, responsibilities and decision-making.

These conditions should not be interpreted as independent variables operating in isolation. They interact.

These conditions also imply that the theory should generate patterned heterogeneity rather than only average effects. Comparative research should therefore ask why translation is stronger in some households, communities or institutions than others under broadly similar exposure. Such variation is theoretically informative because it reveals the conversion conditions that determine whether exposure becomes disruption, whether disruption becomes developmental

disadvantage, and whether collaborative intervention can interrupt the sequence.

The boundary conditions operate jointly. High exposure with strong buffering may produce less translation than moderate exposure combined with depleted household resources. Likewise, a technically appropriate intervention may fail where institutional uptake is weak, or where caregivers lack the time and authority required to implement recommended practices. Gender is especially relevant because climate stress can alter the distribution of unpaid care, productive labour and decision-making, thereby changing who bears the adjustment burden and who can convert available resources into developmental protection. Contextual knowledge fit similarly conditions whether knowledge is actionable within existing livelihood, cultural and institutional arrangements.

Propositions

P9. Gendered distributions of household resources, responsibilities and decision-making condition both Climate-Developmental Translation and Partnership-Mediated Interruption.

P10. Institutional capacity and contextual knowledge fit condition whether partnership-generated adaptations can be sustained and translated into durable developmental buffering.

7. Integrated Theoretical Propositions

The ten propositions collectively form a conditional theory rather than a deterministic causal chain. P1–P5 describe the reproductive pathway. P6–P8 describe the interruptive pathway. P9–P10 specify cross-cutting boundary conditions.

The reproductive process can operate without an organized partnership: vulnerability → exposure → disruption → translation → accumulation → poverty risk.

The interruptive process requires additional conditions: partnership → co-production → capability → interruption → buffering → resilience → altered trajectory.

The asymmetry is theoretically important. Vulnerability can be reproduced without intervention, whereas interruption requires functioning relational and institutional mechanisms.

The propositions generate a programme of empirical research. Longitudinal household and child data can test accumulation. Comparative studies can examine variation in translation under similar exposure. Comparative RPP studies can investigate whether partnership integrity and capability conversion influence interruption.

The propositions are deliberately stated at a level that permits empirical variation in measurement and intervention. They do not prescribe a single indicator of buffering, one form of partnership, or one developmental outcome. Instead, they identify theoretically consequential relationships that can be operationalized differently across settings. This is important for a development theory intended to travel across heterogeneous contexts without assuming that the institutional or cultural form of adaptation is identical everywhere.

Taken together, the propositions specify two linked but non-symmetrical processes. The reproductive pathway explains how disadvantage can persist through ordinary household and institutional responses to recurrent stress, whereas the interruptive pathway requires additional relational and organizational work. This asymmetry prevents the theory from treating intervention as the mirror image of exposure. Interruption requires actors to recognize the pathway, coordinate action, mobilize capabilities, and sustain changed practices. The propositions can therefore be tested individually while also being examined as a connected process architecture.

8. Integrated Theoretical Model

Figure 1 presents the complete theoretical architecture. The reproductive pathway links climate vulnerability to household disruption, Climate-Developmental Translation, developmental disadvantage, constrained life-course opportunities and increased risk of intergenerational poverty. The interruptive pathway links research–practice partnership to co-production, contextualized knowledge, capability strengthening, adaptive practice and institutional learning, Partnership-Mediated Interruption, developmental buffering, early childhood resilience/capability and altered life-course trajectory.

The model integrates the reproductive pathway through which recurrent climate vulnerability may become embedded in childhood developmental conditions and contribute to intergenerational poverty with the interruptive pathway through which sustained research–practice partnerships may strengthen developmental buffering. Climate-Developmental Translation and Partnership-Mediated Interruption constitute the framework's two principal theoretical mechanisms. Household, developmental, partnership and institutional conditions influence the strength and sustainability of these pathways. P1–P10 refer to the theoretical propositions developed in Section 7.

The integrated model should be read as a process architecture rather than as a linear causal diagram. Arrows identify theoretically proposed directions of influence, while the boundary-condition layer indicates that the strength, persistence and reversibility of relationships depend on surrounding conditions. The model also allows feedback: developmental disadvantage can alter future household resources and institutional engagement, while successful buffering can preserve capabilities that subsequently improve adaptive options. Such feedbacks are consistent with the life-course orientation of the framework and suggest that future empirical models should not assume that all pathways are strictly one-directional.

9. Theoretical Contributions

The first contribution is to specify developmental translation as a mechanism linking environmental vulnerability with childhood disadvantage. Rather than treating climate exposure as a direct determinant of developmental outcomes, the framework identifies the household, caregiving and institutional processes through which exposure becomes developmentally consequential.

The second contribution is temporal. The framework connects recurrent environmental stress to developmental accumulation and then to life-course opportunity, bringing climate vulnerability into closer dialogue with theories of childhood and intergenerational poverty.

The third contribution concerns resilience. Rather than locating resilience primarily within the individual child, the framework conceptualizes it as an emergent condition produced through developmental buffering.

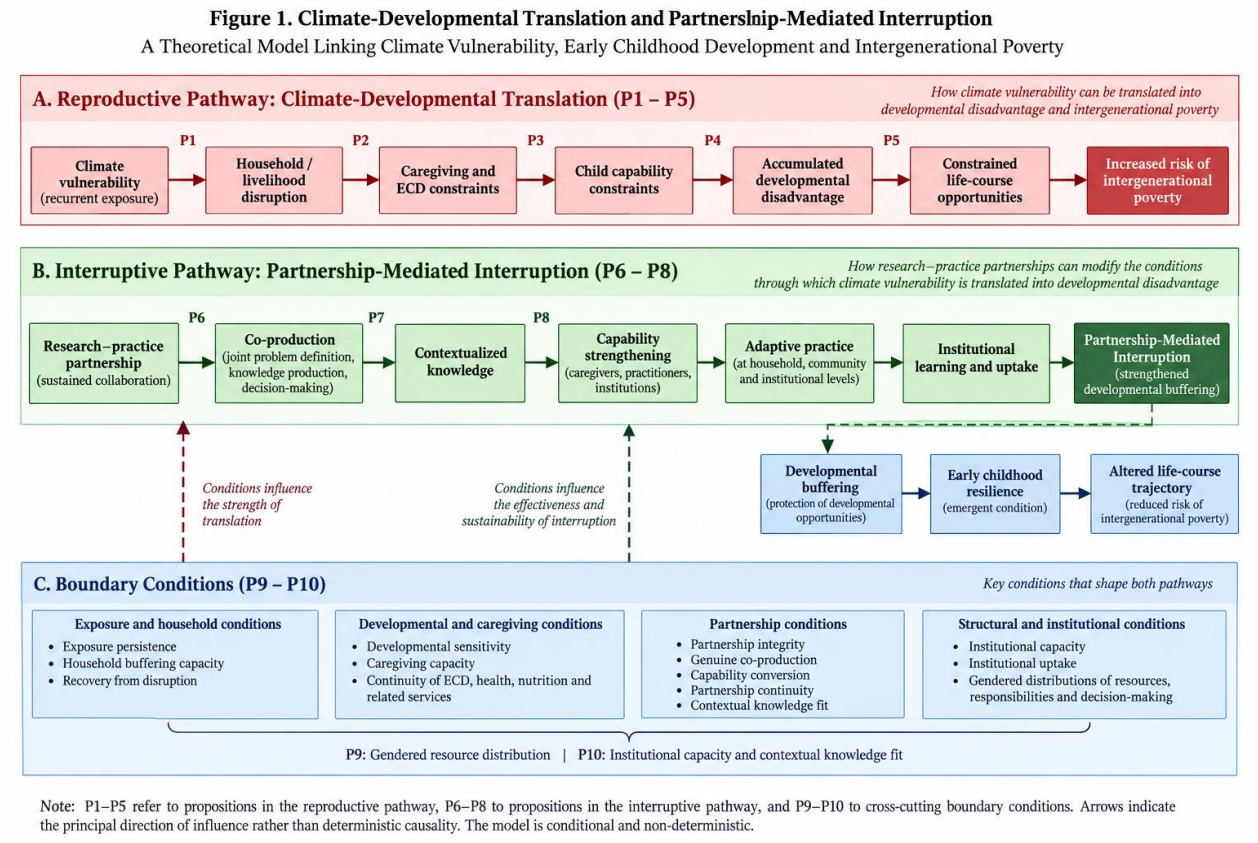


Fig 1: Climate-Developmental Translation and Partnership-Mediated Interruption. Schematic created using OpenAI's ChatGPT image-generation tool (GPT-5.6 Luna) and reviewed by the author for conceptual accuracy and completeness.

The fourth contribution extends RPP theory by theorizing partnership as a potential interruption mechanism within a climate-linked developmental pathway.

The fifth contribution concerns capability. Co-produced knowledge becomes theoretically important because it may strengthen the capabilities of caregivers, practitioners and institutions to act under changing conditions.

The sixth contribution is multilevel integration. The framework connects household, community and institutional processes.

The seventh contribution is gender-sensitive. Gendered distributions of resources, labour and decision-making are incorporated as conditioning structures affecting both translation and interruption.

The eighth contribution concerns contextual knowledge. Local and Indigenous knowledge are not assumed to be inherently sufficient or automatically effective. Their theoretical importance depends on contextual fit and their capacity to be incorporated into workable adaptive practices.

Finally, the framework is explicitly conditional. It does not propose a universal deterministic relationship among climate, childhood and poverty. Its contribution lies in identifying mechanisms and boundary conditions that can be empirically examined across contexts.

The theory also contributes a sharper account of scale. Climate processes, household decisions, caregiving interactions and institutional responses operate at different spatial and organizational levels, but developmental consequences emerge through their connections. A useful intervention at one level may therefore be insufficient when the pathway spans several levels. The emphasis on cross-level linkage helps explain why technically strong interventions can underperform when they are disconnected from the household routines or institutional constraints that shape implementation.

A further contribution is to shift the unit of theoretical explanation from exposure alone to the process of conversion. This move is consequential for development scholarship because it directs attention toward the institutional and relational conditions that make environmental stress consequential or prevent it from becoming so. It also creates a common analytical language for linking climate adaptation, poverty reduction and childhood development without reducing any one domain to another. The framework consequently offers a mechanism for explaining heterogeneity, accumulation and possible interruption rather than simply documenting associations between climate indicators and development outcomes.

10. Research, Practice and Policy Implications

Future studies should move beyond measuring climate exposure alone and examine the sequence from exposure through household disruption, caregiving conditions, developmental opportunity and later capability.

Longitudinal designs are particularly appropriate because the theory is concerned with recurrence, accumulation, recovery and life-course trajectories.

RPP evaluations should examine whether co-produced knowledge becomes capability and adaptive practice and whether those practices influence developmental buffering.

For practice, climate resilience and ECD should not be treated as entirely separate programming domains. Climate adaptation initiatives should consider developmental continuity, while ECD interventions should account for environmental and livelihood conditions affecting families.

For policy, the theory supports stronger integration among climate adaptation, poverty reduction, social protection, nutrition, health and ECD policy.

Gender-responsive policy is necessary because resource distribution, unpaid responsibilities and decision-making can determine who is able to convert knowledge and resources into developmental protection.

The framework also supports meaningful engagement with local and Indigenous knowledge where such knowledge is contextually appropriate and can be connected to effective practice.

A central implementation principle follows:

Scale the mechanism, not necessarily the exact intervention.

The mechanisms of co-production, capability conversion, adaptive practice and developmental buffering may be transferable across contexts even when the specific intervention must remain locally differentiated.

Monitoring and evaluation should distinguish upstream climate exposure; household/livelihood disruption; developmental translation; partnership processes and interruption; developmental buffering and child capability; and longer-term life-course outcomes.

For African development practice, this process orientation also supports differentiated rather than one-size-fits-all programming. Climate-vulnerable communities vary in livelihood strategies, social organization, gendered labour, local knowledge, service access and institutional capacity. Scaling should therefore preserve the mechanism while allowing the form of implementation to be locally adapted. The objective is not to replicate an intervention mechanically but to reproduce the conditions that enable co-production, capability conversion, adaptive practice and developmental buffering.

For empirical evaluation, the framework suggests measuring processes in addition to endpoints. Studies should distinguish exposure from experienced disruption, available resources from their conversion into developmental support, partnership participation from partnership integrity, and short-term adaptation from durable developmental buffering. This would reduce the risk of attributing success to an intervention merely because activities occurred. It would also make it possible to identify where a pathway failed: exposure was too intense, household resources were insufficient, knowledge was not converted into capability, practice did not change, or institutional support was not sustained.

11. Limitations and Scope Conditions

The framework is a theory-building contribution and has not been empirically validated as an integrated model.

It does not claim that climate vulnerability is the sole cause of childhood disadvantage or intergenerational poverty. Political economy, health, education, labour markets, social protection, household structure and other processes may operate simultaneously.

The theory is probabilistic rather than deterministic. Recurrent exposure may increase the likelihood of developmental disadvantage, but household and institutional buffering can alter the outcome.

Childhood disadvantage may increase the risk of constrained life-course opportunities without determining an individual's eventual socioeconomic position.

RPPs are not inherently transformative. Partnerships may reproduce power asymmetries, generate knowledge that is not converted into practice, or fail to achieve institutional uptake.

The framework is most applicable to climate-vulnerable, resource-constrained settings where environmental stress interacts with household developmental conditions, where childhood trajectories have implications for later opportunity, and where sustained collaborative action is institutionally possible.

The theory should therefore be tested rather than assumed to travel unchanged across all settings.

A further scope condition concerns measurement. Several central constructs, including translation, buffering, partnership integrity and contextual knowledge fit, are process constructs that may be difficult to capture with single cross-sectional indicators. Empirical testing should therefore combine repeated observation with qualitative or mixed-method evidence where feasible. This is especially important for distinguishing temporary adaptation from durable changes in developmental conditions and for examining mechanisms that may be invisible in aggregate outcome measures.

12. Conclusion

Climate vulnerability is increasingly a development problem because environmental stress can affect the conditions through which capabilities are formed and opportunities are distributed.

Climate-Developmental Translation specifies how recurrent climate and livelihood pressures can become embedded in household, caregiving and early-childhood systems and contribute to accumulated developmental disadvantage.

Partnership-Mediated Interruption specifies how sustained research–practice partnerships may alter that pathway through co-production, contextualized knowledge, capability strengthening, adaptive practice and institutional learning.

Developmental buffering provides the process connecting successful interruption with protected developmental opportunities, while early childhood resilience is conceptualized as an emergent condition rather than an intrinsic characteristic of the child.

The theory consequently connects environmental vulnerability, household systems, childhood development, capability formation, life-course opportunity and intergenerational poverty within a single conditional architecture.

Its central implication is not that climate change inevitably produces poverty, nor that partnership inevitably produces resilience. Rather, the developmental consequences of climate vulnerability depend on the systems through which exposure is translated, buffered and potentially interrupted.

The value of the framework is therefore explanatory rather than predictive in a narrow sense. It identifies the points at which climate vulnerability may be converted into developmental disadvantage and the conditions under which that conversion may be weakened or interrupted. Its central proposition is that development consequences emerge through systems of conversion, not from exposure in isolation. This provides a stronger basis for designing empirical studies and policy responses that recognize heterogeneity, gendered responsibilities, local knowledge, institutional capacity and the cumulative nature of developmental opportunity.

The framework provides a basis for empirical research

capable of testing these mechanisms across households, communities and institutions and across different climate-vulnerable settings.

Declarations

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Declaration of Competing Interests

The authors declare no competing interests.

Data Availability

No datasets were generated or analysed for this theoretical study.

Declaration of Generative AI and AI-assisted Technologies in the Manuscript Preparation Process

During the preparation of this work, the author used PAPERPAL to assist with literature organization, manuscript organization, language and editorial refinement, and creation of the explanatory schematic presented as Figure 1. The author independently developed the theoretical argument, conceptual architecture, propositions, interpretation, and scholarly conclusions, reviewed and edited the AI-assisted content, and verified the conceptual accuracy and completeness of the explanatory figure. The author takes full responsibility for the content of the published article.

Author Contributions

Never Assan: Conceptualization, development of the theoretical framework, formulation of theoretical propositions, visualization, and writing – original draft.

Saziso Mukomana: Conceptualization, theoretical development, literature integration, critical evaluation of theoretical relationships, and writing – review and editing.

Angela Maphosa: Literature synthesis, construct refinement, proposition evaluation, conceptual validation, and writing – review and editing.

LillieBeth Hadebe: Disciplinary expertise, critical theoretical review, refinement of the conceptual framework, and writing – review and editing.

All authors reviewed and approved the final manuscript and agreed to be accountable for their respective contributions.

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How to Cite This Article

Assan N, Mukomana S, Maphosa A, Hadebe L. Breaking the climate–poverty transmission pathway: a theory of developmental translation, early childhood resilience and research–practice partnership. Int J Humanit Sustain Innov. 2026;2(6):51–59. doi:10.54660/.IJHSI.2026.2.6.51-59.

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