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Modeling Tomorrow: Innovation for Sustainable Development

Innovation Systems, Technological Capabilities, and Sustainability Transitions in Latin America and the Caribbean

CHAPTER III.

Governing Sustainability Transitions

Climate Investment Sequencing in Small Island Developing States: Jamaica's Climate Investment Strategy (2026–2040)

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1. Introduction

Climate investment in small island economies is often presented as a financing-gap problem. Yet which investments should precede others is equally important when infrastructure is interdependent, financing conditional, implementation capacity limited, and shocks alter fiscal space. Renewable generation may be poorly timed if the grid cannot integrate it; finance may be unusable if the pipeline, audit trail, or institutional mandate is unready. Timing is part of strategy.

Jamaica illustrates the stakes. The World Bank and Global Facility for Disaster Reduction and Recovery estimated direct physical damage from Hurricane Melissa, which hit Jamaica in October 2025, at US$8.754 billion, approximately 41% of 2024 gross domestic product (GDP), while the subsequent Planning Institute of Jamaica and Economic Commission for Latin America and the Caribbean assessment placed damage, losses, and additional costs at US$12.232 billion, or 56.7% of GDP; the two measure different scopes (Planning Institute of Jamaica, 2026; World Bank & Global Facility for Disaster Reduction and Recovery, 2025). Against this background, a proposed Climate Investment Strategy (CIS) recommends a modular US$6.5 billion full-ambition planning ceiling across energy, transport, water, coastal resilience, agriculture, public facilities, waste, and enabling systems. It is a candidate pipeline; financing is committed only after project-level evidence (Chedda, 2026).

This article asks how portfolio-level sequencing shapes what climate investments are feasible, financeable, and institutionally sustainable for small island developing states (SIDS). It argues that effective climate investment requires the ordered relaxation of constraints: foundational assets and institutions must be established before more complex investments can perform, financing instruments must be matched to readiness, and monitoring must be connected to rules that alter the portfolio when conditions deteriorate.

The article treats sequencing as the link between adaptation economics, climate public investment management, and SIDS political economy. It identifies the CIS's conditional decision tools - the External Financing and Delivery Trigger (EFDT) and the Partner/Instrument Fit scorecard (PIF) - as policy innovations because they convert changing risk evidence into transparent choices about timing, financing, and delivery. The sections that follow review the literature and method, analyse portfolio design and evidence, and draw implications for SIDS climate strategies.

2. Literature Review

Adaptation economics recognises uncertainty, irreversibility, distribution, and service continuity alongside conventional cost-benefit analysis. Well-designed early warning, resilient infrastructure, water management, and nature-based solutions can produce substantial benefits,

but returns depend on exposure, design, maintenance, institutions, and complementary investments (Global Commission on Adaptation, 2019; Hallegatte et al., 2019; Intergovernmental Panel on Climate Change, 2022). Investment order is important because one project's benefit may depend on whether an enabling system has already been strengthened.

Climate public investment management shifts attention from isolated projects to the institutions that plan, allocate, appraise, implement, and monitor a portfolio, integrating climate considerations across the public investment cycle (International Monetary Fund, 2025). This supports portfolio questions that project appraisal alone cannot answer: which investments enable others, which should be protected when the envelope tightens, and which require regulatory preparation before procurement.

SIDS political economy adds structural constraints. Small markets, concentrated trade, high import dependence, recurrent hazards, and limited administrative depth raise the cost of preparing and coordinating investment. External finance remains indispensable but carries debt, foreign-exchange, creditor, vendor, and conditionality risks. Eastern Caribbean evidence shows that adaptation needs cannot be separated from fiscal, data, and delivery constraints (Pant et al., 2023). Visible projects may also be favoured over enabling systems whose benefits emerge later (Mani & Mukand, 2007; Mullin & Hansen, 2023).

Recent adaptation frameworks emphasise iterative decisions. Uncertain hazards, technologies, prices, and financing conditions require pathways that preserve options and adjust as evidence improves, supported by decision points, monitoring indicators, and institutional responsibility. Physical risk, insurance availability, credit conditions, and public balance-sheet exposure can alter which measures remain feasible (Network for Greening the Financial System, 2024; Organisation for Economic Co-operation and Development, 2024). Conditional sequencing makes the circumstances for acceleration, substitution, refinancing, or deferral explicit.

Existing research explains why adaptation is valuable, public-investment institutions matter, and SIDS face distinctive constraints. It less often treats investment order as the mechanism connecting these domains; the rules governing order commonly remain implicit. The Jamaican case is useful because the CIS makes sequencing explicit across phases, financing layers, institutional responsibilities, and stress-response tools.

3. Methodology

The article uses a structured interpretive case study of Jamaica's proposed CIS, treated as a portfolio-level decision object that assigns investment lines to phases, identifies dependencies, differentiates financing instruments, and specifies corrective triggers. The underlying strategy used a hybrid costing method combining known pipeline costs, comparator unit costs, delivery-enabler allowances, and readiness- and dependency-based phasing.

The article examines the CIS through five pre-specified questions. Which investments are placed early, and what constraints are they intended to relax? How does the financing mix change with phase and risk condition? Which institutions and decision tools are required before scale-up? How does the strategy distinguish targets, screening weights, sensitivities, stress tests, and appraisals? And what action follows when monitoring indicates deteriorating conditions? Evidence was organised in a matrix covering dependency, phase, finance, governance, adaptive rule, and evidentiary status.

Quantitative claims were classified by evidentiary status rather than treated as equally reliable, on the boundary set out in Table 2. Damage figures were checked against the Global Rapid Post-Disaster Damage Estimation (GRADE) assessment and the Planning Institute of Jamaica update, and institutional claims against the February 2026 Auditor General audit.

The author prepared the CIS and is therefore analysing a strategy in whose development he participated. This positionality provides knowledge of the design logic but risks confirmation bias. The study addresses that risk through the pre-specified questions, explicit limitations on quantitative claims, separation of strategy content from external evidence, and no claims of implementation effectiveness. The views expressed are the author's and do not necessarily represent the Ministry of Industry, Investment and Commerce.

4. Analysis of Results and Discussion

4.1 Phasing and portfolio dependencies

The portfolio is organised into three non-overlapping periods: Phase I (2026–2030), Phase II (2031–2035), and Phase III (2036–2040). Their indicative planning envelopes are US$2.2 billion, US$2.8 billion, and US$1.5 billion, respectively. Phase I establishes system enablers, financeable resilience packages, and delivery institutions; Phase II scales investment through aggregation, blended finance, and a stronger pipeline of appraised projects; Phase III embeds climate considerations in fiscal, financial, procurement, and asset-management systems (Chedda, 2026). The sequence is modular: if finance is weaker than assumed, the envelope is right-sized while early warning, water, coastal protection, critical facilities, grid hardening, and delivery capacity are protected.

Energy shows the enabling logic most clearly. Grid modernisation and storage precede full renewable expansion because a storm-resilient network with adequate interconnection capacity is required to integrate variable generation, sustain water pumping and health facilities, and support transport electrification. Grid modernisation and storage, utility-scale renewables, distributed and rooftop solar, and transport electrification together represent 51.1% of the planning ceiling. This is a composition indicator rather than a priority ranking. Water, coastal, and agricultural investments add further dependencies: reliable water requires electricity, coastal ecosystems affect flood exposure and aquifers, and climate-smart agriculture depends on storage, irrigation, and extension capacity. These orderings draw on a comparator base of documented interventions in small island and Caribbean states, selected for hazard-profile similarity, documentation quality, and relevance to a specific line. Barbados’s documented use of water-loss reduction and reclaimed wastewater provides regional support for this ordering (Green Climate Fund, 2018; Inter-American Development Bank, 2024).

Phase I comprises 11 candidate packages, five of which are presented in Table 1. Their ordering reflects system readiness, low-regret resilience, citizen-visible benefits, and their capacity to enable the preparation and financing of later investments.

Separately, the strategy tests how the full portfolio would be prioritised if only US$3.25 billion were available. This constrained-funding scenario makes the protection rule observable. Early warning is retained in full; coastal resilience and programme management retain about four-fifths of their full allocations; water, critical facilities, and grid hardening remain substantial; and agriculture preserves lower-cost measures. Utility renewables, distributed solar,

and transport electrification are paced more sharply to private finance and readiness, while major waste-treatment assets are deferred although policy work continues. A tighter envelope therefore preserves the dependency logic and leaves deferred modules capable of restoration without redesigning the portfolio (Chedda, 2026).

Table 1. Selected packages from the 11-package Phase I candidate pipeline

Selected package	Phase I amount	Sequencing rationale	Default financing approach
Grid modernisation and storage	US$440m	Enables reliable power, renewable integration, water, health, and transport systems.	Concessional loans, domestic budget, and technical-assistance grants.
Water, wastewater, and reuse	US$396m	Non-revenue water reduction and verified savings precede larger storage and reuse investments.	Concessional loans, domestic resources, grants, and possible later refinancing.
Utility renewables and interconnection	US$330m	Rolling procurement is paced to grid headroom, land, safeguards, and interconnection readiness.	Private capital with guarantees or blended finance; concessional enabling works.
Public transport electrification	US$264m	Fleet procurement follows route planning, depot-power assessment, and an operating model.	Concessional and blended finance, guarantees, viability support, and insurance.
Early warning and disaster risk management	US$88m	Low-regret coverage and last-mile protocols protect lives and support risk-financing readiness.	Grants, domestic budget, and risk-transfer layers.

Source: Author's analysis based on Chedda (2026).

4.2 Finance, institutions, and diversification

The CIS separates finance by function and phase. Early investment relies principally on concessional loans, grants, domestic allocations, and policy-linked official finance, which lower costs and support project preparation. Scale-up finance includes thematic bonds, blended structures, guarantees, public-private partnerships, and debt-for-climate swaps, all of which become more credible once the state demonstrates appraised projects, measurable outputs, procurement capacity, and auditable monitoring. Contingent credit, parametric insurance, and catastrophe cover protect fiscal space after a disaster.

Institutions make these layers usable, and the CIS grounds its design in a documented diagnosis. The February 2026 Auditor General performance audit found inconsistent coordination, procurement and staffing delays, incomplete measurement and reporting, and no climate-finance classification or central repository (Auditor General's Department, 2026). Under the CIS, the Climate Finance Unit being established in the Ministry of Finance and the Public Service would maintain the financing register, administer climate budget tagging, coordinate proposals and the pipeline, undertake PIF reviews, and support annual climate accounts, while

the proposed National Climate Trust Fund would pool and blend resources as the portfolio expands.

Sequencing also governs the interface with post-Melissa reconstruction. The National Reconstruction and Resilience Authority is the statutory coordinator for major reconstruction and resilience projects (Office of the Prime Minister, 2026b). The Government announced a coordinated multilateral financing package of up to US$6.7 billion (Office of the Prime Minister, 2026a). Under the CIS, however, none of that amount is counted as secured financing unless matching projects, approvals, financing terms, and drawdown schedules are reconciled with the single project register (Chedda, 2026). This prevents apparent post-disaster abundance from being mistaken for portfolio funding.

Diversification decision rules extend the principle to public balance-sheet exposures and strategic networks. Proposed comply-or-explain limits cap concentration among creditors, vendors, markets, and instruments - no single external creditor above 30% of public external debt and no single vendor above 50% in critical energy or digital systems - alongside annual disclosure of public-private partnership fiscal risks. The Shelter Principle assesses whether a partner or instrument strengthens economic buffers, access to alliances and international rule-making, and societal connections through diaspora, remittance, and skills networks. These dimensions carry a quarter of the PIF weight.

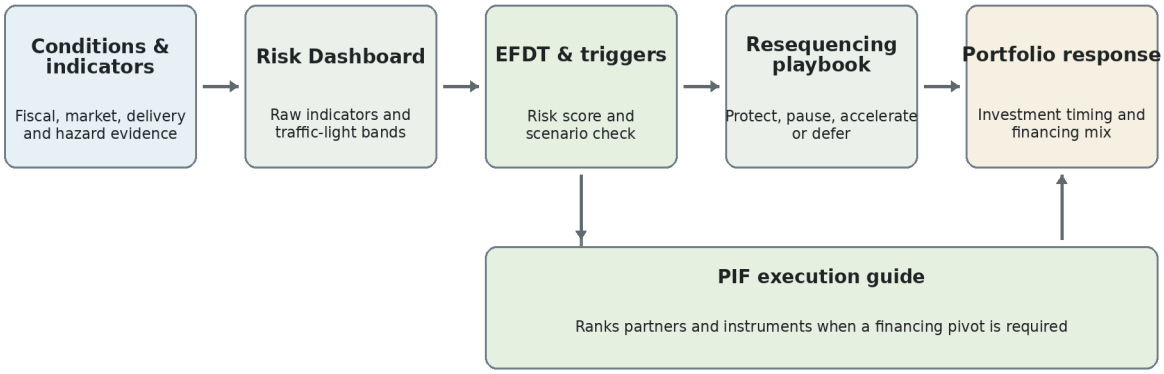
4.3 Conditional sequencing as policy innovation

The EFDT and PIF are the CIS's most distinctive policy innovations. The EFDT combines three normalised sub-scores - exposure, resilience risk, and governance risk, weighted 0.4, 0.4, and 0.2 - into a 0-100 gauge where higher values are worse. Green scores below 30 support routine delivery, while Amber scores from 30 to 50 require vigilance and preparatory adjustment. A Red EFDT score above 50, or an increase of at least 10 points from the prior quarter, counts as one trigger condition; a resequencing playbook is activated only when at least two conditions specified for the relevant scenario are met. An illustrative stress test moves the score from 41.8 to 52.0 after a major hurricane and tighter financing conditions, crossing into Red. In the worked playbook, US$220 million shifts toward storage, water, and coastal resilience, while the grant share rises by 10 percentage points.

Exposure indicators - import dependence and export, creditor, and tourism concentration - move slowly and set the structural position. Resilience and governance risk respond within a quarter to reserve drawdowns, interest-burden shifts, logistics failures, and permitting delays; in the worked scenario, exposure moves 0.6 points while resilience risk moves 17.3. The EFDT level therefore reflects structural vulnerability, while quarter-to-quarter changes signal shifts in current conditions. The fastest-transmitting channels are external-financing tightening, trade and logistics disruption, and tourism-demand shocks.

The PIF guides execution once a decision point is reached. Major grants, loans, guarantees, swaps, bonds, and public-private partnerships are scored against environmental and social alignment, financial terms and debt sustainability, additionality and mobilisation, governance and implementation capacity, shelter quality, network effects, and strategic autonomy. Passing requires a weighted score of at least 3.5 out of 5, no criterion below 2.5, and financial terms not below 3.0; project approval also requires fiscal, appraisal, financing-status, and overlap checks. The EFDT indicates when to pivot; the PIF helps determine how and with whom. Figure 1 presents the operating chain.

Figure 1. Conditional sequencing from risk evidence to portfolio action



Source: Author's construction based on Chedda (2026).

This is governance innovation: the tools connect monitoring to thresholds, playbooks, financing choices, and audit trails. They reduce ad hoc judgement while preserving contextual discretion and require decision-makers to explain why an investment is accelerated, protected, substituted, refinanced, or deferred.

The reporting cycle is essential to that claim. The CIS proposes a quarterly internal dashboard, a six-month early-warning note, annual public climate accounts, Auditor General review every two to three years, and a five-year strategy review aligned with Jamaica's climate commitments. Dashboard compilation is assigned to existing climate-policy and planning institutions rather than a new delivery body, and PIF matrices and financing-status evidence accompany annual reporting. Without that reporting cycle, the EFDT would be only an index and the PIF only a checklist.

4.4 Screening, expected annual loss (EAL) sensitivity, event stress testing, and appraisal

The current value-for-money framework deliberately avoids a portfolio benefit-cost ratio. Relative sector factors are ordinal planning weights under low, central, and high delivery conditions, each normalised to 100 across the portfolio so that relative priority can be compared without reading a factor as avoided dollars per dollar invested. Early warning and disaster risk management, for example, draws 12.4% of the central-case index points while accounting for 3.8% of the envelope. The factors inform ordering; they cannot establish net benefits or replace appraisal.

The probabilistic baseline begins with the tropical-cyclone EAL of approximately 0.9% of GDP estimated by the Inter-American Development Bank and cited in the GRADE assessment, equivalent to US$192.2 million a year on the strategy's US$21.35 billion 2024 GDP base. The present value of 15 equal annual losses at a 5% real discount rate is approximately US$1.995 billion. What 15%, 25%, or 30% of that EAL would represent is then reported as present values of approximately US$299.2 million, US$498.6 million, and US$598.4 million. These are sensitivities to the share of EAL affected by the portfolio, not forecasts of realised benefits (Chedda, 2026). Table 2 sets out the evidentiary boundary.

Table 2. Evidentiary status of the CIS value-for-money components

Component	Permitted interpretation	Not permitted
US$6.5billion envelope	Full-ambition, modular planning ceiling.	Committed expenditure or approved programme.
Sector screening	Ordinal comparison of relative priority within each scenario.	Avoided dollars per dollar invested or a portfolio benefit-cost ratio.
Cyclone EAL sensitivity	Discounted sensitivity to the illustrative share of EAL affected.	Forecast of realised portfolio benefits.
Melissa event test	Separate one-event fiscal stress and resequencing sensitivity.	Addition to EAL or to the other Melissa damage baseline.
Project appraisal	Without- and with-project loss distributions; incremental benefits; lifecycle capital and operation and maintenance costs; residual risk; distributional effects; overlap controls; 3%, 5%, and 7% discount-rate tests.	Approval based only on portfolio screening or event-scale estimates.

Source: Author's analysis based on Chedda (2026), Annex 2.

A separate Melissa-scale event test supports fiscal preparedness and resequencing. It applies illustrative 15%, 25%, and 30% reductions independently to the US$8.754 billion GRADE estimate of direct physical damage and the US$12.232 billion damage-and-loss assessment. The two baselines answer different questions and are never added to each other or to EAL. The event test shows the order of magnitude that a severe shock could place at risk; it does not assign a probability or claim that the portfolio would deliver the selected reduction.

For each major project, the CIS requires a probability-consistent lifecycle appraisal identifying the without-project and with-project loss distributions, incremental benefits, capital and operating costs, residual risk, distributional effects, and overlap with connected investments. Discount rates of 3%, 5%, and 7% must be tested. The principal benefit stream must fit the project: resilience investments may emphasise avoided disruption, while energy, transport, health, or ecosystem projects may require fuel, foreign-exchange, travel-time, health, or environmental benefits. This boundary prevents a planning tool from becoming a substitute for evidence needed at procurement.

5. Findings and implications

Three findings follow. First, sequencing connects benefits to preconditions: grid readiness affects renewables, water, health, and transport; institutional readiness affects access to complex finance; and maintenance and data systems affect whether benefits persist. Second, sequencing links finance to credibility: market-facing capital becomes usable as appraisal, procurement, monitoring, and delivery capability improve. Third, conditional sequencing gives political economy an operational form: pre-agreed rules can protect less visible enabling investments

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