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DEVELOPING A RESEARCH FRAMEWORK FOR THE EFFICIENT AND SCALABLE DELIVERY OF TEMPORARY QUARTERS WHILE ACCOUNTING FOR COMMON-GOOD ECONOMIC FACTORS

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Abstract:

Temporary quarters (TQ) are structured, time-bound arrangements enabling rapid and legitimate crisis response. Beyond shelter, they support social acceptance, transparency, and transitions toward stable long-term conditions. Displacement, climate pressure and infrastructure disruption require tools that connect speed, participation and accountability. The framework integrates social cost–benefit analysis, social return metrics and multi-criteria evaluation, highlighting digital twins, design-for-disassembly and nature-based protection. The Thailand 2004 case illustrates how combined technical, institutional and ecological measures enhance welfare, equity and resilience while keeping governance transparent.

Key words: temporary quarters; public value; social cost-benefit analysis; adaptive governance; nature-based coastal protection.

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1. Conceptual and Normative Foundation

Introduction

Cities often reach the limits of their capabilities during crises. Sudden refugee inflows, infrastructure failures, and natural disasters require rapid responses that remain legally sound and socially legitimate. The traditional trade-off between speed and quality often collapses. This paper shows how a comprehensive research framework for temporary quarters links both aspects (Moore 1995; Organisation for Economic Co-operation and Development (OECD) 2024).

The focus is on local instruments: planning, evaluation, governance, and industrial delivery. Geopolitical topics are out of scope; instead, the paper concentrates on practical tools for shaping public space and on evaluation methods. The goal is a framework that combines responsibility, social impact, and technical quality. Social justice and legitimacy become central when evaluation, governance, and technology are conceived jointly (Boardman et al. 2018; HM Treasury 2022). Case studies from Europe and Asia

—such as Jordan and Bangladesh—show that temporary quarters require not only buildings but institutional innovation (UN-Habitat 2024; United Nations High Commissioner for Refugees (UNHCR) 2025; Intergovernmental Panel on Climate Change (IPCC) 2023).

Crises rarely align with the rhythm of urban routines. Needs spike, administrative capacity reacts slowly, and climate extremes increasingly reshape risk architectures. What is required is an approach that combines speed, legitimacy, and scalable delivery capability. Temporary quarters are touchstones: visible, socially sensitive, and politically exposed (IPCC 2023; International Organization for Migration (IOM) 2024).

Definition of a Temporary Quarter

Temporary quarters (TQ) are time-limited, spatially integrated, and institutionally framed housing-and-service arrangements enabling transitions out of crisis without cementing parallel structures. “Temporary” denotes a consciously designed interim phase: reversible, socially connective, and administratively interoperable. A typical period is 0–36 months with planned deconstruction or repurposing. Spatial integration ensures access to education, work, and health; institutional embedding provides responsibilities, participation, and monitoring (United Nations Human Settlements Programme (UN-Habitat) 2024; ISO 20887; ISO 37120/37123).

Three axes define TQ: Time—limited use with design for disassembly/adaptability (DfD/A); Space—urban embedment; Institutions—governance, financing, scorecards, audit windows. Indicators include time to safe

shelter, service access, employment rate, school attendance, complaint throughput, and reuse rates (OECD 2024; ISO 37123).

Theory and Norm: Public Value and Adaptive Governance

Public value provides the normative foundation: policy creates value when protection, participation, and system relief increase measurably (Moore 1995). Adaptive governance links learning and evidence through cycles of hypothesis, implementation, measurement, and revision (Ostrom 1990; OECD 2024). Evaluation, governance, and technology are integrated through scorecards and audit windows (HM Treasury 2022).

Economic methodology uses social cost–benefit analysis as the baseline, with distributional weights and robustness analysis. Monetisable effects can be represented via Social Return on Investment (SROI); non-monetisable ones via Multi-Criteria Decision Analysis (MCDA) (SVI 2012).

Governance is supported by an Urban Governance Council (UGR).

2. Integrated Evaluation Architecture

Target quantity — socially weighted context

The key target metric is the Social Net Present Value (SNPV):

$$SNPV_i = \sum_{t=0}^{T} \frac{\sum_k w_k B_{i,k,t} - \sum_m C_{i,m,t}}{(1+r)^t}$$

Where r is the discount rate, $B_{\{i,k,t\}}$ benefit components, $C_{\{i,m,t\}}$ cost

blocks, and w_k equity weights.

Example — SNPV (simplified)

$$\text{PV}_{\text{Benefits}} = \frac{7.2}{1.03} = 6.99, \text{PV}_{\text{Costs}} = \frac{6.3}{1.03} = 6.12, \text{SNPV} = 0.87$$

A positive SNPV signals a net social gain. Weighting via wk makes distributional effects explicit.

Ratio indicators, MCDA, and regret

The Benefit–Cost Ratio (BCR) and score and regret indicators can be formalised as:

$$BCR = \frac{\sum_{t=0}^{T} \frac{\sum_k w_k B_{i,k,t}}{(1+r)^t}}{\sum_{t=0}^{T} \frac{\sum_m C_{i,m,t}}{(1+r)^t}}$$

$$Score_i = \sum_j \alpha_j s_{i,j}, \quad Regret_i(s) = V^*(s) - V_i(s)$$

Benefit–cost ratios and SROI enable norm-aligned comparison; MCDA captures non-monetisable effects; regret analysis supports robust decisions.

Evaluation Systems and Time Metrics

Beyond monetary indicators, time is central: it determines how rapidly protection and participation are achieved (HM Treasury 2022; Boardman et al. 2018).

Time-based indicators — Time to Use (TTU) and Time to Service (TTS)

$$TTU \coloneqq t_{SE} - t_E, \quad TTS \coloneqq t_{ZD} - t_E$$

Example: $t_{\mathrm{E}} = 0$, $t_{\mathrm{SE}} = 12$, $t_{\mathrm{ZD}} = 45$. Thus: TTU = 12, TTS = 45.

Combining time and value indicators

$$SNPV^+ = SNPV \cdot \left(1 + b_1 \cdot \frac{TTU_{ref} - TTU}{TTU_{ref}} + b_2 \cdot \frac{TTS_{ref} - TTS}{TTS_{ref}}\right)$$

$b1$ and $b2$ weight the welfare effects of shortening time-to-shelter and timeto-services.

Data and Evidence Architecture

Digital twins, Building Information Modeling (BIM), and indicator platforms link social, technical, and ecological metrics. International Organization for Standardization (ISO) 19650 governs information flows; ISO 20887 mandates design for disassembly; ISO 37120/37123 outline city indicators.

Example — scorecard excerpt

$$Score_t = 0.3 \cdot S_{TTU}(t) + 0.3 \cdot S_{TTS}(t) + 0.4 \cdot S_{Integration}(t)$$

If S_{TTU} improves from 60 to 80, overall score increases by approximately six points.

Data governance and transparency

Models are versioned with assumptions and data provenance; audit windows ensure traceability and institutional memory.

Operational dashboards and learning cycles

Traffic-light dashboards combine TTU, TTS, integration, and governance quality. Quarterly reviews link indicators to decisions (contracts, weights, participation formats).

3. Governance, Technology and Delivery

Governance and Procurement

An Urban Governance Council (UGR) brings together administration, affected communities, civil society, business, and academia. It defines goals, coordinates hearings, prioritises, maintains scorecards, and oversees audit windows (OECD 2019; 2024).

Process architecture (stage gates)

- Gate 1 — Needs and scenarios

Gate 2 — Site & master plan
Gate 3 — Procurement & financing
Gate 4 — Construction & operations
Gate 5 — Deconstruction & reuse

Outcome-based remuneration (sketch)

$$Pay = P_0 + \gamma_1 \max\left(0, TTU_{ref} - TTU\right) + \gamma_2 \max\left(0, TTS_{ref} - TTS\right) + \gamma_3 \cdot \%LocalJobs - \gamma_4 \cdot Defects$$

Linking remuneration to time and quality factors makes legitimacy and performance jointly manageable.

Technology and Delivery

Offsite manufacturing, modular construction, and digital twins shorten delivery time at constant quality. BIM (ISO 19650) and DfD/A (ISO 20887) ensure traceability, reuse, and long-term adaptability (McKinsey 2019).

- Phase 1 — Needs assessment

Phase 2 — BIM-based design
Phase 3 — Outcome-oriented procurement
Phase 4 — Offsite production & assembly

Phase 5 — Operation & reuse

Example — traceability

$$Trace_t = \sum_{i=1}^{n} m_i \cdot (1 + \lambda_i)^{-t}$$

m_i = material quantity; λ_i = degradation factor.

4. Case Evidence, Limits and Outlook

Case Study "Thailand Tsunami 2004"

Temporary quarters combined with early-warning systems and mangroves increase welfare and resilience: early-warning systems shorten reaction times; mangroves attenuate wave energy and generate co-benefits (United Nations Office for Disaster Risk Reduction (UNDRR) 2015; World Meteorological Organization (WMO) 2023).

Evaluation

$$NB = \sum_{t=0}^{T} \frac{B_t - C_t}{(1 + r)^t}$$

Baseline: negative SNPV; TQ-only: $SNPV_B = -1.407$, $BCR_B = 0.885$; combined: $SNPV_C \approx 11.6$, $BCR_C \approx 1.8$.

Methodological Limits

Results depend on discount rate, equity weights, proxies, and data quality. Sensitivity analysis is crucial (HM Treasury 2022; Adler 2016; Boardman et al. 2018).

Sensitivity example

$$SNPV(r) = \sum_{t=0}^{T} \frac{B_t - C_t}{(1 + r)^t}$$

Raising r from 3%→5% reduces NPV considerably.

Distributional weights, data quality, and model uncertainty

Equity weights expose normative choices; data and model uncertainty add noise. Robust Decision Making (RDM) and regret analysis help identify resilient policy combinations.

Research Framework and Outlook (incl. conclusion)

The framework integrates theory (public value), evaluation (SCBA, SROI, MCDA), governance (UGR, transparency), and technology (BIM, digital twins, DfD/A). It aims to reconcile speed, legitimacy, and delivery capability.

Priority research lines

- Deliberative weighting of participation
- Calibrating equity weights wk
- Validating SROI proxies
- Integrating nature-based valuation
- Declining discount rates
- Bias correction in digital twins
- Real-time evaluation under outcome-based contracts

Research logic

Learn = f(Measure, Decide, Revise)

Learning cycles help identify which combinations of shelter design, governance arrangement and nature-based measures work robustly across scenarios and contexts.

Integrated conclusion

Temporary quarters are central components of urban resilience. Integrated packages that combine physical, institutional, and nature-based measures deliver the strongest and most equitable public value. The proposed framework unites socially weighted NPV, benefit–cost ratios, MCDA scoring, regret analysis, BIM, digital twins and DfD/A into a reproducible architecture for legitimate and scalable crisis interventions.

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