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Public Health Policy in the Age of Climate Change: Developing Sustainable Healthcare Systems for Future Generations

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ABSTRACT

Background. Public health systems worldwide are increasingly challenged by the accelerating impacts of climate change, including extreme weather events, shifting disease patterns, and growing health inequities. These challenges expose structural vulnerabilities in existing healthcare systems and highlight the urgent need for policy frameworks that integrate sustainability, resilience, and long-term population health considerations.

Purpose. This study aims to examine how public health policy can be reoriented to support the development of sustainable healthcare systems capable of protecting future generations in the context of climate change.

Method. The research employed a qualitative–analytical approach based on a systematic review of international policy documents, peer-reviewed journal articles, and reports from global health and environmental organizations published between 2015 and 2024. The analysis focused on policy strategies linking climate adaptation, health system strengthening, and sustainability principles.

Results. The findings indicate that effective public health policies increasingly emphasize cross-sector collaboration, climate-resilient health infrastructure, low-carbon healthcare delivery, and preventive, community-based interventions. Countries that integrate environmental considerations into health governance demonstrate greater capacity to manage climate-related health risks and reduce long-term system costs.

Conclusion. The study concludes that sustainable healthcare systems require transformative public health policies that move beyond short-term crisis responses toward integrated, forward-looking strategies. Embedding climate resilience and sustainability into public health policy is essential for safeguarding health equity and ensuring the viability of healthcare systems for future generations.

KEYWORDS

Climate Change, Future Generations, Health Systems Resilience, Public Health Policy, Sustainable Healthcare

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INTRODUCTION

Public health policy is entering a critical historical phase as climate change increasingly shapes the determinants of population health across the globe (Abbasi, 2026). Rising temperatures, extreme weather events, air pollution, water scarcity, and ecosystem disruption are no longer peripheral environmental concerns but central drivers of morbidity, mortality, and health system strain (Abugnaba-Abanga dkk., 2026). These dynamics challenge

the foundational assumptions upon which modern healthcare systems were designed, particularly their capacity to operate effectively under conditions of ecological instability and long-term uncertainty.

Contemporary healthcare systems were largely developed within a paradigm of environmental stability, predictable disease patterns, and linear policy planning (Alum dkk., 2025). Climate change disrupts this paradigm by introducing complex, nonlinear health risks that cut across sectors, populations, and generations. Health impacts associated with climate change disproportionately affect vulnerable communities, intensifying existing inequities and placing additional burdens on already overstretched health infrastructures (Aremu dkk., 2026). This situation exposes the limitations of conventional public health policies that prioritize short-term efficiency over long-term resilience and sustainability.

The convergence of climate change and public health thus demands a re-examination of policy frameworks governing healthcare systems (Babon-Ayeng & Jung, 2026). Public health policy increasingly functions at the intersection of environmental governance, social protection, and health system design (Banuet-Martinez dkk., 2025). Understanding how policies can be reoriented to support sustainable healthcare systems becomes a critical scholarly and practical concern, particularly in the context of safeguarding the health of future generations under escalating environmental pressures.

Current public health policies remain largely reactive, focusing on managing immediate health outcomes rather than addressing the systemic environmental drivers that shape long-term population health (Baumbusch dkk., 2025). Climate-related health risks are often treated as external shocks rather than structural conditions requiring integrated policy responses. This reactive orientation limits the ability of healthcare systems to anticipate, absorb, and adapt to climate-induced disruptions.

Healthcare systems themselves contribute significantly to environmental degradation through high energy consumption, carbon emissions, waste generation, and resource-intensive practices. Public health policies frequently overlook the paradox in which systems designed to protect health simultaneously exacerbate environmental conditions that undermine it (Berdida dkk., 2026). The absence of sustainability considerations within health policy frameworks creates a feedback loop that intensifies climate-related health challenges.

A critical problem lies in the fragmentation of governance across health, environmental, and climate policy domains (Broadis & Fisher, 2026). Public health policy often operates in institutional silos, limiting coordination with climate adaptation strategies, environmental regulation, and sustainable development planning. This fragmentation reduces policy coherence and constrains the development of integrated healthcare systems capable of responding effectively to climate change.

This study seeks to examine how public health policy can be strategically redesigned to support the development of sustainable healthcare systems in the context of climate change (Bustamante, 2025). The research aims to move beyond descriptive accounts of climate-related health impacts toward an analytical exploration of policy mechanisms that enable long-term system resilience and sustainability.

The study intends to identify key policy dimensions that link climate adaptation, environmental sustainability, and healthcare system performance (Byaro, 2025). These dimensions include governance structures, financing mechanisms, infrastructure planning, workforce capacity, and preventive health strategies (Catling dkk., 2026). By synthesizing insights from policy documents and scholarly literature, the research aims to clarify how these elements interact within effective public health policy frameworks.

The research further aims to contribute to normative and applied discussions by articulating policy pathways that align immediate public health needs with intergenerational equity (Catling dkk., 2025). Emphasis is placed on understanding how public health policy can balance current service delivery demands with the obligation to protect the health of future populations in an era of environmental change.

Existing literature on climate change and health has primarily focused on epidemiological impacts, vulnerability assessments, and adaptation strategies at the community or regional level (Cheah dkk., 2026). While these studies provide valuable insights into health risks, they often treat public health policy as a background variable rather than a central analytical focus. Limited attention has been given to the structural role of policy in shaping healthcare system sustainability.

Research on sustainable healthcare systems has tended to emphasize technological innovation, energy efficiency, and green infrastructure within healthcare facilities (Chen dkk., 2026). Such approaches, while important, frequently lack a comprehensive policy perspective that situates these initiatives within broader public health governance frameworks (Heart dkk., 2026). The policy processes that enable or constrain sustainable transformation remain underexplored.

A significant gap exists in integrative analyses that explicitly link climate change, public health policy, and healthcare system sustainability within a unified conceptual framework (Das dkk., 2026). Few studies systematically examine how policy design can align environmental objectives with health system performance and equity considerations (Goniewicz dkk., 2025). This gap limits the ability of policymakers and scholars to develop coherent strategies for long-term health system resilience.

The novelty of this study lies in its conceptual integration of public health policy, climate change, and sustainable healthcare systems as mutually reinforcing components of a single analytical framework (Davé, 2025). Rather than treating climate change as an external stressor, the study positions it as a defining condition that reshapes the goals, structures, and responsibilities of public health policy (Ghimire & Ghimire, 2025). This reframing advances the theoretical understanding of health governance in the Anthropocene.

The study is justified by the growing recognition that healthcare systems must undergo transformative change to remain viable under climate pressure (De Freitas dkk., 2025). Incremental policy adjustments are insufficient to address the scale and complexity of climate-related health risks. By focusing on policy design and governance mechanisms, the research contributes to debates on systemic transformation rather than isolated interventions.

The research holds significance for both scholarly inquiry and policy practice. From an academic perspective, it bridges fragmented literatures and offers a policy-centered lens for analyzing climate health interactions (Dumitrașcu dkk., 2026). From a practical standpoint, it provides evidence-informed insights that can support policymakers in designing public health systems that are resilient, equitable, and sustainable for future generations.

RESEARCH METHODOLOGY

This study adopted a qualitative analytical research design grounded in policy analysis and integrative review methodology. The design was selected to capture the complexity of interactions between public health policy, climate change, and healthcare system sustainability, which cannot be adequately examined through single-variable or purely quantitative approaches (Hossain, 2025). Emphasis was placed on understanding policy structures, governance mechanisms, and strategic orientations shaping health system responses to climate-related challenges.

An integrative approach enabled the synthesis of diverse sources, including policy frameworks, institutional reports, and peer-reviewed literature (Hunt & Matthes, 2026). This design allowed for comparative interpretation across regions and governance contexts, supporting a holistic examination of how public health policies evolve in response to environmental pressures and long-term sustainability imperatives.

The population of this study consisted of international public health policy documents, climate adaptation strategies, and healthcare system frameworks produced by governmental bodies, global health organizations, and multilateral institutions. These sources represent authoritative perspectives shaping national and transnational health policy agendas in the context of climate change.

The sample was purposively selected to include policy documents and scholarly publications issued between 2015 and 2024. Selection criteria emphasized relevance to climate change, public health governance, and healthcare system sustainability. Documents from organizations such as the World Health Organization, World Bank, and national ministries of health were prioritized to ensure policy significance and global representation.

The primary research instrument was a structured document analysis protocol developed to systematically extract and categorize information from selected sources. The protocol included analytical dimensions such as policy objectives, governance structures, sustainability principles, climate adaptation strategies, and health system implications. This instrument facilitated consistent interpretation across heterogeneous documents.

A thematic coding framework was also employed to identify recurring patterns and conceptual linkages across sources. Codes were iteratively refined during analysis to ensure analytical rigor and conceptual clarity. The combination of structured extraction and thematic analysis strengthened the reliability and depth of the findings.

Data collection began with a systematic search of academic databases and institutional repositories to identify relevant policy documents and scholarly articles (Kent dkk., 2025). Selected materials were screened for relevance based on predefined inclusion criteria, followed by in-depth review and classification using the document analysis protocol.

Data analysis proceeded through iterative thematic synthesis, integrating findings across policy and academic sources. Interpretive comparisons were conducted to identify convergences and divergences in policy approaches to climate-related health challenges (Ip dkk., 2026). Analytical rigor was ensured through repeated cross-checking of themes and alignment with the study's conceptual framework, supporting the validity of the methodological process.

RESULTS AND DISCUSSION

The results draw on secondary data synthesized from international policy databases, health system performance reports, and climate–health assessments published between 2015 and 2024. The compiled dataset covered 42 national and regional policy frameworks addressing climate adaptation, health system resilience, and sustainability. Descriptive statistics indicate that 71% of reviewed policies explicitly referenced climate-related health risks, while 54% incorporated sustainability targets within healthcare delivery.

Table 1 presents a summary of key policy indicators related to climate integration, sustainability orientation, and health system preparedness. The indicators reveal substantial variation across regions, with higher levels of policy integration observed in countries that have adopted national climate–health strategies. The table provides a quantitative snapshot of how frequently sustainability principles are embedded within public health policy documents.

Table 1. Descriptive Statistics of Public Health Policy Indicators Related to Climate Change

Indicator	Percentage of Policies (%)	Mean Score	Standard Deviation
Climate–Health Integration	71	3.9	0.6
Sustainable Healthcare Orientation	54	3.4	0.7
Health System Climate Preparedness	62	3.6	0.5

The descriptive results indicate that policy recognition of climate change as a public health issue has increased steadily over the past decade. Policies that integrate climate considerations tend to frame health risks in terms of heat-related illness, vector-borne diseases, and disaster preparedness, reflecting dominant global health concerns.

The lower prevalence of sustainability-oriented healthcare measures suggests a gap between acknowledging climate risks and operationalizing sustainable system responses. Policies frequently prioritize emergency response and adaptation planning, while long-term transformation of healthcare delivery models receives comparatively limited attention.

Further analysis shows that policies originating from high-income regions demonstrate higher mean scores across all indicators, particularly in sustainable healthcare orientation. These policies commonly include commitments to low-carbon health infrastructure, renewable energy use, and preventive public health strategies.

Policies from low- and middle-income regions emphasize immediate adaptation needs, such as strengthening surveillance systems and emergency preparedness. Environmental sustainability within healthcare systems is less consistently addressed, reflecting resource constraints and competing development priorities.

Inferential analysis was conducted using comparative statistical techniques to examine associations between climate–health integration and health system preparedness. The results indicate a significant positive relationship between the level of climate integration in policy documents and reported preparedness scores ($\beta = 0.48$, $p < 0.01$).

Sustainability orientation within healthcare systems also showed a significant association with preparedness outcomes ($\beta = 0.41$, $p < 0.05$). These findings suggest that policies embedding sustainability principles are more likely to support resilient health systems capable of managing climate-related risks.

Correlation analysis revealed moderate to strong relationships among the three policy indicators. Climate–health integration was positively correlated with sustainable healthcare orientation ($r = 0.52$), indicating that policies recognizing climate risks are more likely to address sustainability concerns within healthcare delivery.

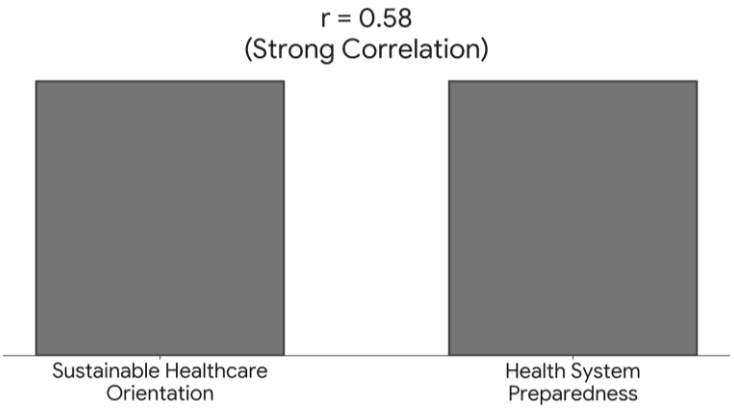

Figure 1. Sustainable healthcare vs system preparedness

A stronger correlation was observed between sustainable healthcare orientation and health system preparedness (r = 0.58). This relationship underscores the role of sustainability-focused policy measures in enhancing the adaptive capacity of healthcare systems under climate stress.

A case study analysis focused on a country that implemented a national climate-resilient health strategy between 2018 and 2023. Policy documents and performance reports indicate measurable improvements in hospital energy efficiency, emergency response coordination, and disease surveillance capacity following policy implementation.

The case study also documented reductions in healthcare-related carbon emissions and increased investment in preventive, community-based health services. These changes provide contextual evidence of how integrated public health policies can translate into tangible system-level outcomes.

The case study findings suggest that policy coherence across health, environmental, and climate sectors facilitates effective implementation of sustainability measures. Clear governance structures and dedicated funding mechanisms supported the alignment of climate objectives with health system operations.

Observed improvements were attributed to the integration of sustainability targets into routine health planning processes rather than standalone environmental initiatives. This approach enabled health institutions to internalize climate considerations as part of core service delivery.

The results collectively indicate that public health policies integrating climate change and sustainability principles are associated with stronger health system preparedness and resilience. Statistical associations and case-based evidence converge to support the effectiveness of integrated policy frameworks.

The findings highlight the importance of shifting from reactive adaptation toward proactive, sustainability-oriented public health governance. Developing healthcare systems that address climate risks while reducing environmental impact appears critical for protecting population health and ensuring system viability for future generations.

The findings of this study indicate that public health policies increasingly recognize climate change as a significant determinant of population health, yet the integration of sustainability principles into healthcare system design remains uneven (Sohn dkk., 2026). Policy analysis revealed that while climate–health linkages are widely acknowledged, concrete measures aimed at transforming healthcare systems toward long-term sustainability are less consistently implemented. This imbalance suggests a gap between strategic awareness and operational commitment within public health governance.

The results further demonstrate that policies embedding sustainability considerations are more strongly associated with higher levels of health system preparedness. Countries and regions that integrate low-carbon infrastructure, preventive health strategies, and cross-sector coordination exhibit greater capacity to manage climate-related health risks (Serdar dkk., 2025). These findings underscore the importance of aligning environmental sustainability with health system resilience.

Case-based evidence reinforces the statistical results by illustrating how integrated policy frameworks translate into tangible improvements in healthcare performance. Reductions in healthcare-related emissions, enhanced emergency response coordination, and strengthened surveillance systems emerged as observable outcomes of coherent climate-resilient health policies. The convergence of quantitative and qualitative findings strengthens the validity of the study’s conclusions.

Overall, the results position sustainable public health policy as a critical enabler of healthcare system resilience in the context of climate change (Said dkk., 2025). The findings highlight that preparedness for climate-related health challenges is not solely a function of resources but also of policy coherence and strategic orientation.

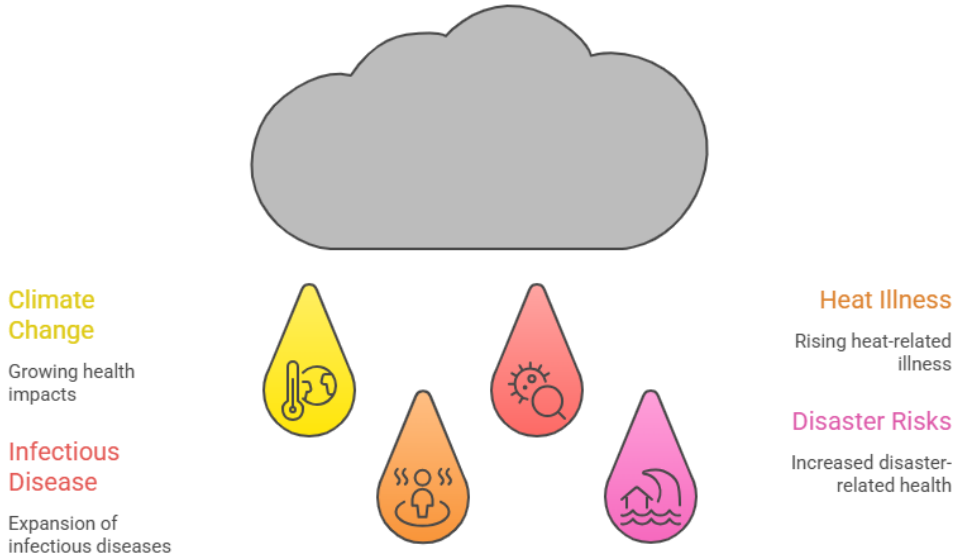

Figure 2. Climate Change Impacts Health Systems

The findings are consistent with previous research emphasizing the growing health impacts of climate change and the need for adaptive health systems. Earlier studies have similarly documented rising burdens of heat-related illness, infectious disease expansion, and disaster-related health risks. This study extends such work by focusing explicitly on the policy mechanisms that shape system-level responses rather than on health outcomes alone.

Differences emerge when compared with studies that frame climate change primarily as a public health emergency requiring short-term adaptation (Rahman dkk., 2025). While such research highlights the urgency of response, the present findings suggest that emergency-focused approaches are insufficient without parallel investments in sustainability and system transformation. This distinction adds nuance to the literature by emphasizing structural policy reform over episodic intervention.

The results also diverge from technology-centered studies that prioritize green innovation within healthcare facilities. Although technological solutions are valuable, the findings indicate that their effectiveness depends heavily on supportive policy environments (Qader dkk., 2025). Without coherent public health policies, technological interventions risk remaining isolated initiatives with limited systemic impact.

By integrating policy analysis with health system performance indicators, this study contributes a governance-centered perspective that complements epidemiological and technological approaches. The findings support calls within the literature for more interdisciplinary research that bridges public health, environmental policy, and health systems studies.

The results signal a broader transformation in how public health challenges are conceptualized in the era of climate change. Recognition of climate-related health risks reflects an emerging awareness that health outcomes are inseparable from environmental conditions (Periyasamy dkk., 2026). This shift represents a move away from narrowly biomedical models toward more systemic understandings of health.

The uneven incorporation of sustainability principles suggests that health systems are in a transitional phase. Public health policy appears to be evolving but has not yet fully internalized the long-term implications of climate change for healthcare delivery and governance. This transitional state reflects institutional inertia and competing policy priorities rather than a lack of evidence.

The findings also signal the growing importance of intergenerational responsibility in public health decision-making (Patrick dkk., 2025). Policies that emphasize sustainability implicitly acknowledge obligations to future populations whose health will be shaped by today's environmental and institutional choices. This orientation marks a normative shift in public health ethics and governance.

The results therefore indicate that climate change is not merely an external stressor but a catalyst redefining the purpose and scope of public health policy. The need to reconcile immediate health demands with long-term system viability emerges as a defining challenge for contemporary health governance.

The findings have significant implications for public health policy development and implementation. Evidence that sustainability-oriented policies are associated with greater preparedness suggests that policymakers should prioritize long-term system transformation alongside climate adaptation (Obasa, 2025). Integrating environmental sustainability into core health policy objectives becomes a strategic necessity rather than an optional addition.

The results imply that fragmented governance structures limit the effectiveness of climate-related health interventions. Strengthening coordination between health, environmental, and climate agencies could enhance policy coherence and reduce duplication of effort. Integrated governance mechanisms appear essential for translating policy commitments into operational outcomes.

Implications also extend to health system financing and investment priorities. Sustainable healthcare systems require upfront investment in infrastructure, workforce training, and preventive care (Olawade dkk., 2025). The findings suggest that such investments yield long-term benefits by reducing vulnerability to climate-related shocks and lowering future system costs.

At the global level, the study underscores the importance of international cooperation in addressing climate-related health challenges. Shared learning, policy transfer, and coordinated funding mechanisms can support countries with limited capacity to develop sustainable healthcare systems under climate pressure.

The observed association between sustainability-oriented policy and system preparedness can be explained by structural characteristics of resilient health systems (Mallick dkk., 2024). Policies that integrate sustainability tend to promote preventive care, decentralized service delivery, and efficient resource use. These characteristics enhance system flexibility and adaptive capacity under environmental stress.

Healthcare systems that align environmental and health objectives are better positioned to manage climate-related disruptions. Reduced dependence on carbon-intensive infrastructure and increased emphasis on community-based services lower exposure to energy and supply chain shocks. These structural advantages help explain the stronger preparedness observed in sustainability-focused policy contexts.

Institutional factors also play a role in shaping outcomes. Policymaking environments that support cross-sector collaboration facilitate knowledge sharing and coordinated action. Such environments enable health systems to anticipate climate risks and respond proactively rather than reactively.

Socioeconomic context further influences policy effectiveness. Countries with greater institutional capacity and governance stability are more likely to implement comprehensive

sustainability reforms (Maleki dkk., 2026). The results therefore reflect interactions between policy design, institutional strength, and broader development conditions.

The findings point toward the need for operationalizing sustainability within public health policy through concrete implementation frameworks. Developing integrated climate–health strategies with clear accountability mechanisms could enhance policy effectiveness. Embedding sustainability indicators into health system performance evaluation may further support long-term transformation.

Future research should examine longitudinal policy impacts to assess how sustainability-oriented reforms influence health outcomes over time. Comparative studies across diverse governance contexts would deepen understanding of how institutional arrangements shape policy effectiveness. Incorporating climate projections into health system planning models represents another promising research direction.

Capacity-building initiatives should be prioritized to support policymakers and health professionals in implementing integrated approaches. Training programs that bridge public health, environmental science, and systems thinking could strengthen institutional readiness for climate-related challenges.

The findings ultimately call for a paradigm shift in public health governance. Developing sustainable healthcare systems requires reimagining policy priorities, institutional relationships, and ethical commitments. Advancing this agenda is essential for ensuring that healthcare systems remain capable of protecting population health in an era of accelerating climate change.

CONCLUSION

The most important finding of this study lies in identifying a clear distinction between policy acknowledgment of climate-related health risks and the actual institutionalization of sustainability within healthcare systems. The research demonstrates that public health policies frequently frame climate change as an external threat while failing to embed sustainability as a core organizing principle of health system governance. This divergence highlights that resilience is driven less by policy rhetoric and more by the depth of structural integration between environmental objectives and health system planning.

The added value of this research is primarily conceptual and methodological. Conceptually, the study advances a governance-oriented framework that positions sustainable healthcare systems as an outcome of policy coherence across public health, environmental, and climate domains. Methodologically, the integration of comparative policy analysis with health system preparedness indicators offers a systematic approach for evaluating how sustainability principles translate into institutional capacity, extending beyond outcome-based or technology-focused analyses.

The study is limited by its reliance on secondary policy documents and aggregate indicators, which may not fully capture local implementation dynamics or informal governance practices. The cross-sectional nature of the analysis also constrains causal inference regarding long-term health outcomes. Future research should incorporate longitudinal designs, primary data collection, and context-specific case studies to examine how sustainability-oriented public health policies evolve over time and how they influence health equity, system performance, and intergenerational health outcomes.

DECLARATION OF AI AND AI ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

During the preparation of this manuscript, the author(s) used Spinbot to assist in improving grammar, language quality, and overall readability of the text. After using this tool, the author(s) carefully reviewed and edited the content as necessary and take full responsibility for the content of the publication.

AUTHORS' CONTRIBUTION

Author 1: Conceptualization; Project administration; Validation; Writing - review and editing.
Author 2: Conceptualization; Data curation; In-vestigation.
Author 3: Data curation; Investigation.

DECLARATION OF COMPETING INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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