

Institutional Barriers to Climate Adaptation in Water Resource Management: A Qualitative Assessment of South Western Nigeria's River Basins

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Abstract

South Western Nigeria's River Basins face escalating climate risks, but adaptation by mandated River Basin Development Authorities (RBDAs) is failing. The methodological approach quantitatively assesses the institutional barriers responsible for this gap. The two objectives were to identify and quantify the severity of financial, coordination, policy and legal barriers in the Ogun-Osun and Benin-Owena basins, and to examine the statistical relationship between these barriers and the implementation of adaptation strategies. A quantitative, cross-sectional survey design was used, sampling 125 professionals from RBDAs and State Ministries. Data were collected via a validated structured questionnaire, quantified with mean variance, standard deviation and linear regression analysis. Findings revealed that Financial Barriers (Mean=4.55, SD=0.06) are the most severe, followed by Coordination Barriers (Mean=4.20, SD=0.75) and Policy and Legal Barriers (Mean= 3.45, SD=0.98 and Linear regression confirmed a significant negative relationship ($R^2 = .456$, $p < .001$) between barriers and implementation, within barriers. The study recommended that adaptation failure is a governance failure, primarily driven by financial and coordination-related institutional barriers and a dedicated National Water Adaptation Fund and mandatory Federal-State Basin Coordination Platforms.

Keywords: Adaptation, Climate Change, Institutional Barriers, Nigeria Basins, Quantitative Analysis, Water Management.

Introduction

The global climate crisis is fundamentally a water crisis (IPCC, 2023). Climate change intensifies the hydrological cycle, manifesting in more severe droughts, extreme rainfall, and devastating floods, thereby placing unprecedented stress on the institutions that manage water resources. In Sub-Saharan Africa, this challenge is amplified by a high pre-existing climate vulnerability and a critical reliance on rain-fed agriculture. Consequently, the capacity of governing institutions to manage water under conditions of deep uncertainty is a central determinant of national resilience (Ojo et al., 2020). The scholarly consensus has moved toward "adaptive governance," which posits that the traditional,

rigid, top-down management structures common in many nations are ill-suited for the dynamic nature of climate change, requiring instead more flexible, collaborative, and learning-based institutional frameworks (Jaisridhar et al., 2025; Majahana et al., 2025; Masud & Khan, 2024; Yulianto et al., 2025).

Nigeria, Africa's most populous country, exemplifies this institutional challenge. The nation has a comprehensive, hierarchical framework for water governance, anchored by the Federal Ministry of Water Resources and implemented through twelve River Basin Development Authorities (RBDAs). These RBDAs are, by law, responsible for the development and management of surface and groundwater, irrigation, and flood control within their respective catchments (Adeoti et al., 2023). In recognition of climate threats, Nigeria has also developed high-level policies, including a National Adaptation Plan Framework, which designates the water sector as a key priority (Federal Ministry of Environment, 2023). This policy framework explicitly calls for strengthened institutional coordination to build a climate-resilient nation.

However, a persistent and critical gap exists between these national aspirations and the reality of on-the-ground implementation. This disconnect is starkly evident in the South Western geopolitical zone, a region of immense economic and demographic importance that hosts the Ogun-Osun and Benin-Owena river basins. This region, which includes the megacity of Lagos, faces severe and escalating climate impacts, particularly intense urban and riverine flooding (Orimoogunje & Aniramu, 2025) and related threats to water supply and infrastructure (Adeoti et al., 2023). The agencies mandated to manage these threats, the RBDAs, are widely critiqued as being "poorly organized" and largely ineffective, failing to meet even their basic mandates, let alone the complex new challenge of climate adaptation (Ojo et al., 2020).

This study confronts the problem of this policy-implementation failure. The research problem is the absence of a quantitative assessment of barriers within the Southwestern Basin and the critical lack of effective, large-scale adaptation in the South Western basins despite clear climate risks and formal institutional responsibility. While numerous studies have identified barriers in Nigeria qualitatively (Ojo et al., 2020) or discussed general governance fragmentation (Ojo et al., 2020), there has been no quantitative assessment to identify, rank, and test the impact of these barriers within the South Western basins. This leaves policymakers without empirical, data-driven evidence to prioritize reforms, forcing them to rely on anecdotal critiques.

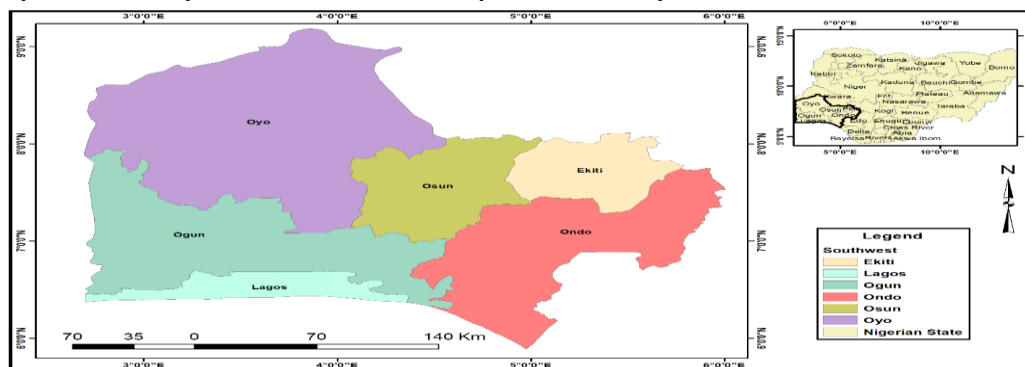
The significance of this study is therefore twofold. Academically, it contributes vital empirical data to a field largely dominated by qualitative case studies. By operationalizing "institutional barriers" and "adaptation implementation" as measurable variables, it provides a replicable quantitative model that can be used to diagnose institutional performance in other basins or sectors. It moves beyond simply stating "barriers exist" to

ranking their severity and *proving* their statistical relationship to outcomes. Practically, this research provides an evidence-based roadmap for reform. By identifying which barriers financial, coordination, or policy are the most severe and have the strongest negative impact, this study enables the Federal Ministry of Water Resources and the National Council on Climate Change to target their interventions with precision, allocating limited political and financial capital to the reforms that matter most.

To address this problem, the study pursued two specific objectives. The first objective was to identify and quantify the perceived severity of institutional barriers (financial, policy, and coordination) to climate adaptation in the Ogun-Osun and Benin-Owena river basins. The second objective was to examine the statistical relationship between the perceived severity of these institutional barriers and the effective implementation of water resource adaptation strategies.

The scope of this research is geographically delimited to the administrative and operational zones of the Ogun-Osun River Basin Development Authority and the Benin-Owena River Basin Development Authority in South Western Nigeria. Conceptually, the study is focused on quantifying the perceptions of professional staff within the water governance system (RBDA's and State Ministries). It investigates institutional barriers, defined as obstacles arising from the formal and informal rules and resource-allocation mechanisms of the governance system. The study excludes an analysis of non-institutional barriers, such as public awareness or specific technical deficits, to maintain a sharp focus on the institutional failures that hinder professional-led adaptation.

Map of the Study Area and Brief write ups on the study area



Source: Authors, 2025

This study was conducted within the operational jurisdictions of the Ogun-Osun River Basin Development Authority and the Benin-Owena River Basin Development Authority, covering the South Western geopolitical zone of Nigeria. The zone comprises six states: Lagos, Ogun, Oyo, Osun, Ondo, and Ekiti, with a combined land area of approximately

77,818 square kilometres and a population exceeding 27 million (National Population Commission, 2021). The area lies roughly between latitudes 6°N and 9°N and longitudes 2°E and 6°E, bordered by the Republic of Benin to the west, Kwara and Kogi States to the north, Edo and Delta States to the east, and the Atlantic Ocean to the south.

The region is drained principally by the Ogun and Osun Rivers, alongside smaller tributaries that feed into the Lagos Lagoon system, while the Benin-Owena basin drains the eastern flank around Ondo and Ekiti States. Major urban and administrative centres within the study area include Ibadan, Abeokuta, Oshogbo, Ado-Ekiti, Akure, and Ikeja, each hosting state ministries and RBDA field offices relevant to water governance. The climate is tropical, characterized by distinct wet and dry seasons, with mean annual rainfall ranging between 1,200 mm and 1,800 mm,

supporting rain-fed agriculture, freshwater fisheries, and hydropower generation that underpin the region's dependence on functional water resource management institutions.

The choice of this area was informed by its high exposure to climate-induced hydrological stress, including recurrent flooding and seasonal water scarcity, and the presence of established but underperforming institutional structures, making it a representative setting for examining institutional barriers to adaptation.

Literature Review

Theoretical/Conceptual Framework

Institutional Barriers refers to the formal and informal rules, norms, governance structures, and resource allocation mechanisms that constrain adaptation efforts. These are failures of the system that prevent effective action (Ojo et al., 2020). Adaptation Implementation is defined as the process of adjustment to actual or expected climate and its effects, specifically the execution of planned policies and projects designed to moderate harm or exploit beneficial opportunities (IPCC, 2023). In this study, it is operationalized as the perceived level of progress by institutional actors in moving adaptation strategies from a state of mere planning to tangible, on-the-ground action, such as building resilient infrastructure, enforcing conservation laws, or running flood early-warning-systems. This study also has two complementary institutional theories:

For this study, Institutional Barriers are majorly categorised into the following:

- i. Financial Barriers: These are obstacles related to the availability, accessibility, and adequacy of funding. This includes insufficient budgetary allocations from the federal government, as well as complex bureaucratic hurdles that prevent access to international climate funds, a gap estimated to be in the billions of dollars annually for Nigeria (Chingombe & Musarandega, 2021; Odwori, 2022).
- ii. Coordination Barriers: These refer to failures in horizontal and vertical collaboration. This includes poor coordination and data sharing between the

- federal RBDAs and state-level ministries, as well as weak engagement with local stakeholders, leading to "overlapping functions" and "rival agencies" (Azhoni et al., 2024; Kwikima, 2025; Salamanca-Cano & Durán-Díaz, 2023).
- iii. **Policy and Legal Barriers:** This category includes conflicting, fragmented, or ambiguous laws and policies. It also refers to the weak enforcement of existing regulations, which undermines the credibility and effectiveness of managing agencies (Giles et al., 2021; Orimoogunje & Aniramu, 2025). This theory was propounded by Elinor Ostrom (1990) in their work *Governing the Commons*, and later refined as a core tool for policy analysis. (e.g., (Ostrom, 2011)). The IAD framework provides a methodology for analysing how institutions, which Ostrom defines as the "rules-in-use," shape the interactions of actors within a specific "action arena." The framework posits that the attributes of the physical world, the community, and the rules-in-use combine to influence actor behaviour, which in turn produces specific outcomes. This study uses the IAD framework to structure its hypothesis. The South Western water basin is the "action arena." The "institutional barriers" (e.g., "conflicting mandates," "no funding") are the dysfunctional "rules-in-use." The study hypothesizes that these dysfunctional rules will statistically predict a negative outcome.
 - iv. **Legal Barriers and Adaptive Governance Theory:** Propounded by scholars such as Folke et al. (2005) and Pollard et al. (2023) opined that this theory emerged from resilience science to address the failures of traditional, rigid management systems in the face of complex, uncertain challenges like climate change. The theory argues that effective governance for social-ecological systems requires attributes such as flexibility, polycentricity (multiple centres of decision-making), social learning, and robust stakeholder collaboration. This study uses Adaptive Governance theory as a benchmark. The variables being measured (e.g., coordination failures, legal rigidity, weak stakeholder links) are direct, measurable indicators of a lack of adaptive governance. The hypothesis that these barriers impede implementation is a direct test of the theory's central claim: that a rigid, uncoordinated, non-collaborative system will fail to adapt effectively.

Empirical Review

There is a strong consensus that institutional barriers are a primary constraint on environmental management in Nigeria. Ojo et al. (2020) conducted qualitative interviews with institutional heads in Nigeria and identified financial constraints, inadequate legal frameworks, and low political will as the primary barriers to climate change adaptation in

the water sector. This is further supported by Odwori (2022), who identified institutional and governance barriers, alongside resource and funding constraints, as the top-ranked obstacles to water adaptation in river basin contexts. A systematic bibliometric review by Jaisridhar et al. (2025) similarly identified governance fragmentation, resource limitations, and policy misalignments as the primary institutional barriers in climate adaptation governance globally, confirming that these challenges are not unique to Nigeria.

This national-level problem is reflected at the basin level. (Ojo et al., 2020) and Azhoni et al. (2024) both identified fragmented institutional frameworks, weak inter-agency coordination, and inadequate legal structures as systemic problems undermining Integrated Water Resource Management (IWRM) in Nigeria. Specifically, within this study's area, studies found that stakeholder participation, a key component of coordination was non-inclusive and failed to incorporate local needs. This pattern mirrors findings by Kwikima (2025) in Tanzania, where stakeholder participation was limited to implementation stages, with decision-making dominated by government actors, and by Salamanca-Cano & Durán-Díaz (2023), who found that river basin stakeholders across a 30-year period were largely excluded from policy evaluation and follow-up phases. Similarly, Orimoogunje & Aniramu (2025), in a review of flood resilience in Lagos (within the Ogun-Osun catchment), identified "weak enforcement of urban planning regulations" and "poor intervention initiatives" as critical governance failures.

The foundational role of the RBDAs themselves is also in question. Studies on Nigerian water governance institutions describe River Basin Development Authorities as underfunded and failing in their core mandates (Adeoti et al., 2023)." This funding issue is systemic, with Adeoti et al. (2023) finding in a systematic review that weak institutional frameworks and poor financing are the greatest threats to water infrastructure sustainability in Nigeria. Ray Biswas & Rahman (2023) similarly found that local governments face persistent challenges in implementing climate change adaptation policies, particularly in the water sector, due to inadequate inter-agency coordination and resource constraints.

Ray Biswas & Rahman (2023) similarly found that local governments face persistent challenges in implementing climate change adaptation policies due to inadequate financing, weak inter-agency coordination, and fragmented institutional arrangements. A global review by Ojo et al. (2020) confirmed that institutional barriers are frequently the most significant impediments to adaptation in developing nations. Comparative evidence from Zea-Reyes et al. (2021) in Beirut further demonstrated that political interference, competing priorities, and limited knowledge create interlocking vicious cycles that compound institutional barriers, a dynamic consistent with the cascading effects observed in Nigerian river basin governance.

The literature review confirms that institutional barriers are widely believed to be a problem. However, this consensus is built almost entirely on qualitative studies (Ojo et al., 2020), general reviews (Adeoti et al., 2023). What is missing, and what this study provides, is a comparative quantitative assessment across the two major South Western basins. No known study has operationalized these barriers into a measurable instrument and ranked their perceived severity from the perspective of the managers themselves. Furthermore, the statistical relationship between the severity of these barriers and the level of adaptation implementation has not been empirically tested in this context, leaving a critical gap in evidence-based policy.

Methodology

Hypothesis

H₁: There is a significant negative relationship between the perceived severity of institutional barriers and the implementation of adaptation strategies.

This study employed a quantitative, cross-sectional survey research design. This approach was justified as the most effective method for collecting data on the perceptions, attitudes, and reported behaviours of a geographically dispersed professional population at a single point in time. This design allows for the statistical measurement of the severity of barriers and the analysis of correlations and predictive relationships between variables, which directly addresses the research objectives. The population of the study (N = 150) consisted of all senior and mid-level professional staff within the two relevant federal parastatals, the Ogun-Osun River Basin Development Authority (OORBDA) and the Benin-Owena River Basin Development Authority (BORBDA) as well as their counterparts in the State Ministries of Water Resources and Environment in the core catchment states (Lagos, Ogun, Oyo, Ondo, and Edo). A sample size of 150 respondents was targeted to ensure statistical power. A multi-stage sampling technique was employed. First, purposive sampling was used to select the relevant organizations and participant roles (Directors, Heads of Departments, Senior Engineers, and Senior Planners). Following this, snowball sampling was used, wherein initial participants were asked to recommend other colleagues with the requisite professional experience, a technique justified for accessing this specific and often difficult-to-reach expert network.

The primary data collection method was a structured, self-administered questionnaire. A pilot test was then conducted with 15 water managers in an adjacent basin (Niger-Delta) who were excluded from the final sample. Feedback from the pilot test was used to refine the clarity of the items. The reliability of the scales was confirmed through the pilot test, yielding a Cronbach's Alpha coefficient of 0.89 for the Institutional Barriers scale and 0.86 for the Adaptation Implementation scale, both indicating high internal consistency. The

collected data were analysed using SPSS (Version 26). The method of data analysis for Objective 1 involved descriptive statistics (means, standard deviations, and frequencies) to rank the barriers. For Objective 2, which tested the hypothesis, Pearson correlation and Simple Linear Regression were used to determine the statistical relationship and predictive power of the composite barrier score on the composite implementation score. The target population comprised all professional staff in technical and management roles within the Ogun-Osun and Benin-Owena RBDAs and the State Water Resources departments of Lagos, Ogun, Osun, Ondo, Ekiti and Edo State Ministries being estimated at 200 people based on the available 2025 records. Purposive sampling was used to identify 150 individuals with direct responsibility for climate adaptation planning or water infrastructure. From the 150 questionnaires administered, 131 were retrieved (87.3% response rate), and 125 were valid after screening, representing 62.5% of the total eligible population (125/200) and 83.3% of the targeted sample (125/150) which is sufficient for the planned regression analyses

The research relied on a composite barrier score that aggregates financial, coordination, and policy and legal barriers, which may obscure differential effects of individual barrier types on adaptation implementation. The cross-sectional design precluded relationships identified as associational and do not capture temporal dynamics of institutional change. In addition, the non-probability sampling indicated purposive limits generalizability beyond the professionals surveyed in Ogun-Osun and Benin-Owena RBDAs and associated State Ministries. Findings were therefore interpreted as indicative of barriers within these specific institutional contexts rather than nationally representative.

Results and Discussion

The first objective was to identify and quantify the perceived severity of institutional barriers. Respondents were asked to rate their agreement with statements about barriers on a 5-point Likert scale (1 = Not a Barrier, 5 = Very Severe Barrier). The mean scores and standard deviations for the three barrier categories are presented in Table 1.

Table 1: Descriptive Statistics for Perceived Severity of Institutional Barriers (n=125)

Barrier Category	N	Minimum	Maximum	Mean	Std. Deviation	Rank
1. Financial Barriers	125	3.00	5.00	4.55	0.60	1
2. Coordination Barriers	125	2.50	5.00	4.20	0.75	2
3. Policy & Legal Barriers	125	1.50	5.00	3.45	0.98	3
<i>Valid N (Listwise)</i>	125					

Source: Field Survey, 2025

As shown in Table 1, the analysis of perceived severity clearly identifies a hierarchy of institutional barriers. Financial Barriers emerged as the most severe constraint, with a mean

score of 4.55 (SD = 0.60). This indicates a very strong consensus among participants that issues such as "inadequate federal budgetary allocations" and "difficult access to international climate funds" are critical.

This was followed by Coordination Barriers (Mean = 4.20, SD = 0.75), which was also perceived as a very severe barrier. This score reflects strong agreement with items like "poor coordination between our agency and State-level agencies" and "lack of a shared data platform." Policy and Legal Barriers (Mean = 3.45, SD = 0.98) were ranked as the least severe of the three, though the mean score is still above the neutral point of 3.0, indicating it is a moderate barrier.

The second objective was to examine the statistical relationship between the perceived severity of institutional barriers and the effective implementation of water resource adaptation strategies. A composite score for "Institutional Barriers" was created by averaging all barrier items, and a composite score was created for "Adaptation Implementation. A simple linear regression was conducted to test this hypothesis.

Table 2: Simple Linear Regression Model Predicting Adaptation Implementation (n=125)

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	F	Sig.
1	.675 ^a	.456	.451	0.523	103.54	.000 ^b
Coefficients			Unstandardized Coefficients	Standardized Coefficients	t	Sig.
			B	Std. Error	Beta(\$)	
(Constant)			4.88	0.32		15.25
Institutional Barriers (Composite)			-0.62	0.06	-0.452	- 10.17
<i>a. Predictors: (Constant), Institutional Barriers (Composite)</i>						
<i>b. Outcome Variable: Adaptation Implementation (Composite)</i>						

Source: Authors, 2025

The linear regression analysis provides strong support for the research hypothesis. The model was statistically significant, $F(1,123) = 103.54$, $p < .001$, and explained a substantial proportion of variance in Adaptation Implementation, $R^2 = .456$. This indicates that 45.6% of the variance in perceived adaptation implementation can be statistically accounted for by the perceived severity of institutional barriers. The coefficients table confirmed that the composite Institutional Barriers variable is a highly significant predictor. The standardized beta coefficient was $\beta = (-.675, p < .001)$. This indicates that for every one standard deviation

increase in the perceived severity of institutional barriers, the perceived level of adaptation implementation decreases by 0.675 standard deviations, holding other factors constant. These findings provide a data-driven diagnosis of adaptation failure in Southwestern Nigeria. The identification of financial barriers as paramount ($M = 4.55$, $SD = 0.06$) directly corroborates the quantitative findings of Odwori (2022), who ranked funding constraints as the highest-priority barrier to water adaptation in river basin contexts. This also aligns with Ray Biswas & Rahman (2023), who similarly found that financial and coordination constraints are the most persistent barriers to effective climate adaptation implementation. The present study demonstrates that critiques of "poor funding" for RBDAs (Adeoti et al., 2023) reflect not merely general dissatisfaction but the most severe, critical blockage perceived by operational managers. The high severity of coordination barriers ($M = 4.20$, $SD = 0.75$) provides quantitative evidence for the "rival agencies" and "overlapping functions" documented by Ojo et al. (2020) and Azhoni et al. (2024). It substantiates basin-specific findings suggesting that observed weaknesses in stakeholder participation reflect a broader, systemic coordination failure. This aligns with Maeda et al. (2025) who found that stakeholder participation was the most influential governance factor predicting adaptation implementation success in Tanzanian Local Government Authorities. That institutional barriers predict 45.6% of the variance in implementation constitutes a powerful indictment of the current governance system. This result provides strong empirical support for the Institutional Analysis and Development (IAD) framework (Ostrom, 2011): dysfunctional "rules-in-use," operationalized here as institutional barriers, are statistically significant predictors of negative outcomes. The findings also validate core tenets of Adaptive Governance theory (Albrecht, 2023; Folke et al., 2005). The constituent variables of the barriers high coordination failure and policy rigidity are the inverse of adaptive governance principles. The model's strong negative coefficient ($\beta = -.675$) thus quantitatively demonstrates that deficits in adaptive governance are directly associated with adaptation failure. This study moves beyond describing the "policy-implementation gap" to statistically measuring its primary institutional drivers.

Conclusion and Recommendations

This study investigated the institutional barriers to climate change adaptation in the Ogun-Osun and Benin-Owena river basins. The research concludes that the significant and persistent failure to implement adaptation strategies is not a technical or knowledge-based problem, but a direct, predictable, and statistically verifiable outcome of a dysfunctional institutional governance system.

The study successfully met its objectives. First, it identified and ranked the primary barriers, finding that crippling financial constraints are perceived as the most severe obstacle, followed closely by systemic coordination failures between federal and state agencies.

Second, the study confirmed its hypothesis, demonstrating that these institutional barriers have a strong, statistically significant negative relationship with the level of adaptation implementation, explaining nearly half of its variance. The current institutional framework, as perceived by its own managers, is fundamentally unfit for the purpose of building a climate-resilient water sector.

Based on the empirical findings, the following recommendations are proposed:

- i. Based on the finding that financial constraints are the most severe barrier, the Federal Government must establish a dedicated, ring-fenced National Water Adaptation Fund. This fund should be capitalized by a combination of ecological funds and international climate finance. Critically, it must have simplified, transparent, and direct access protocols for River Basin Development Authorities (RBDAs) to bypass the bureaucratic bottlenecks identified as a key financial barrier.
- ii. To address the finding that coordination failures significantly predict poor implementation, the National Council on Climate Change must activate its mandate to enforce inter-agency coordination. This should involve establishing mandatory, co-chaired, and resourced Federal-State Basin Coordination Platforms for the Ogun-Osun and Benin-Owena basins, moving beyond the current ad-hoc, ineffective committee structures.

Given that policy barriers were identified as a moderate but significant constraint, the Federal Ministry of Water Resources, in collaboration with other agencies should initiate a comprehensive regulatory harmonisation process. This should involve reviewing and reconciling conflicting laws and overlapping mandates across federal and state agencies; Strengthening enforcement mechanisms for existing water governance and climate adaptation regulations; and establishing a unified legal framework that clearly defines institutional responsibilities, reduces ambiguity, and enhances accountability.

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