



Baboons at the Crossroads: Comparative Perspectives on Geography, Governance, and Adaptation in Africa and Saudi Arabia [†]

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Abstract

Baboons inhabit diverse ecological and socio-political landscapes, from African savannahs and forests to the fragmented habitats of the Arabian Peninsula. This comparative synthesis examines how geography, governance, and adaptation shape human–baboon interactions and conservation outcomes. Geography determines habitat heterogeneity, species distribution, and encounter rates with people. Governance ranges from community-based management in Africa to centralized, technology-driven approaches in Saudi Arabia, influencing mitigation and policy implementation. Adaptation, especially behavioral flexibility, helps baboons persist in human-dominated landscapes while complicating management. Together, these factors support locally tailored, scalable conservation strategies and highlight the need for stakeholder engagement, technological innovation, and climate resilience to improve coexistence.

Keywords: baboon management; human–wildlife conflict; socio-ecological systems (SES); governance and conservation

1. Introduction

Baboons (*Papio* spp.) (Erxleben, 1777) are widely distributed Old World monkeys spanning African savannahs and forests to Arabian arid mountains, where ecological and socio-political contexts generate complex human–wildlife conflict dynamics. However, human–baboon interactions were not always defined by conflict; these relationships have deep historical roots, reaching as far back as ancient Egypt where hamadryas baboons were frequently revered in art and religion. Today, their remarkable ecological adaptability, complex social structures, and frequent interactions with human environments have drawn considerable scientific attention from behavioral ecology, genomics, conservation biology, and biomedical research [1], with research expanding toward interdisciplinary approaches integrating advanced technologies, long-term ecological monitoring, and socio-cultural dimensions [2].

Adopting a socio-ecological systems (SES) perspective [3], this study conceptualizes baboon management as emerging from interactions between ecological conditions, social behaviors, and governance structures within complex, multi-scalar networks of environmental, social, and political factors. Africa remains the epicenter of baboon diversity, hosting chacma baboon (*Papio ursinus*) (Kerr, 1792), olive baboon (*P. anubis*) (Lesson, 1827), yellow



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baboon (*P. cynocephalus*) (Linnaeus, 1766), kinda baboon (*P. kindae*) (Lönnberg, 1919), Guinea baboon (*P. papio*) (Desmarest, 1820), and hamadryas baboon (*P. hamadryas*) (Linnaeus, 1758) across habitats ranging from moist savannahs to arid mountain ranges. Long-term field projects, including the Amboseli Baboon Research Project in Kenya and the Tsaobis Baboon Project in Namibia—although not focal management case studies—have generated foundational knowledge on behavior, ecology, genetics, and conservation challenges [4–6].

In Saudi Arabia, the National Center for Wildlife’s baboon management program incorporates advanced technologies, specifically AI-processed survey data and remote sensing for population mapping and hotspot identification, with future phases exploring the use of drones and sensor networks. These data-driven insights support ecological restoration, conflict mitigation, and the enforcement of anti-feeding regulations focused on *P. hamadryas* [7,8].

Baboons’ social plasticity and opportunistic foraging place them at the forefront of human–wildlife conflict in regions undergoing urbanization and agricultural expansion [4,9,10]. Rising conflict across Africa has driven non-lethal deterrents, community-based management, and habitat connectivity initiatives [5,9,11], while Arabian studies focus on hamadryas baboons adapted to fragmented arid habitats, inspiring centralized governance combining ecological restoration and AI-assisted population analysis [7,12]. However, few studies compare baboon ecology and management across biogeographically distinct regions, constraining development of adaptive, cross-context conservation frameworks [13,14]. Furthermore, traditional regional reviews frequently isolate ecological variables from human socio-political factors. The SES framework explicitly bridges this knowledge gap by demonstrating how biological traits, human behaviors, and governance structures dynamically interact, thereby providing a mechanism to translate local observations into scalable, cross-regional policies. This study addresses these gaps by integrating a literature review with SES theory and policy analysis to synthesize multidisciplinary evidence across ecological, social, and governance dimensions of baboon conservation in Africa and Saudi Arabia, providing a transparent, reproducible foundation for advancing global baboon management.

2. Materials and Methods

2.1. Integrative Socio-Ecological Systems Framework and Systematic Review Design

This study integrates a systematic literature review with socio-ecological systems (SES) theory to examine baboon populations’ behavior, conflict dynamics, and conservation strategies across Africa and Saudi Arabia, elucidating how biophysical factors, human practices, and governance structures interact to shape management outcomes. Table 1 summarizes the analytical approach.

A comprehensive search of Web of Science, Scopus, and Google Scholar (2000–2025) included English-language peer-reviewed articles, governmental reports, and grey literature using the search terms: (‘human–wildlife conflict’ OR ‘management’ OR ‘governance’) AND (‘Africa’ OR ‘Saudi Arabia’). Following PRISMA guidelines, an initial retrieval of 543 records was screened, resulting in 28 core studies selected for synthesis. Inclusion criteria required that literature address baboon behavioral ecology, conflict dynamics, or conservation policy within these focal regions. Studies that focused solely on biomedical research or lacked clear socio-ecological management applications were excluded. Data extracted encompassed baboon ecological adaptations, habitat characteristics, human–baboon interactions, management interventions, socio-cultural contexts, technological tools, and policy frameworks [2,7,15]. Both qualitative narratives and quantitative indicators (e.g., population trends, conflict incidence, intervention efficacy) were synthesized [6,16]. Analytical procedures involved thematic coding, where extracted data were systemati-

cally mapped onto the four predefined layers of the SES framework (Ecological, Social, Governance, and Technological).

Table 1. The Socio-Ecological Systems (SES) Integration Framework used to analyze baboon conservation dynamics.

Layer	Focus Area	Description
1. Ecological	Species and Habitat	Explores species interactions and habitat health, emphasizing how ecological factors influence biodiversity and ecosystem stability.
2. Social	Community and Culture	Focuses on human values and practices, highlighting how community beliefs and cultural habits shape environmental stewardship.
3. Governance	Laws and Policies	Examines the role of regulations, enforcement, and policies in preserving ecosystems through structured governance frameworks.
4. Technological	AI and Data Tools	Highlights advanced monitoring systems and data analytics that drive adaptive management and enhance ecological insights.

2.2. Analytical Approach and Framework Development

Guided by Ostrom’s SES theory [3], ecological and social data were integrated to develop a dynamic, adaptive socio-ecological–policy framework for baboon conservation and conflict management. This framework articulates feedback loops among baboon ecological traits, habitat features, human behaviors, and governance mechanisms including regulatory enforcement and community participation [17]. By situating species- and habitat-specific characteristics within this integrated system, the framework facilitates identification of leverage points critical for adaptive conservation strategies, while enhancing methodological transparency and replicability for other human–wildlife conflict systems [13,18].

2.3. Governance and Policy Document Analysis

Governance and policy documents were systematically reviewed to characterize regulatory frameworks, enforcement mechanisms, and management strategies across regions [19]. Official plans and policy reports from conservation authorities (Saudi National Center for Wildlife, South African National Parks) were prioritized to capture current governance trends and support classification of governance modalities [13]. Governance models were classified as centralized (defined as top-down, state-driven national management programs) or decentralized (defined as localized, community-driven, or NGO-partnered initiatives), enabling structured comparative analyses within the SES framework [20,21]. Key excerpts from primary documents illustrate governance diversity and enhance reproducibility [18].

2.4. Linkage to Regional Ecology Synthesis

The systematic review and integrative SES framework (Table 1) underpin analyses of baboon species diversity, habitat characteristics, human impacts, behavioral dynamics, conflict drivers, and governance models [3,13]. Management is conceptualized as arising from bi-directional interactions among ecological attributes, social behaviors, governance regimes, and technological capacities forming adaptive management cycles—revealing cross-scalar interactions shaping human-baboon coexistence throughout the study.

3. Results

It is important to note that due to the heterogeneity of the extracted qualitative and quantitative data, alongside the formatting constraints of this proceeding paper, a quantitative meta-analysis was not performed. Consequently, the findings are presented as a systematic qualitative synthesis, which represents a methodological limitation of the current study.

3.1. Geography, Governance, and Adaptation

Human–baboon dynamics across Africa and Saudi Arabia are shaped by geography, governance, and baboon adaptation as biophysical and societal landscapes rapidly evolve.

3.1.1. Geography: Diverse Landscapes and Species

Africa sustains six baboon species (*Papio ursinus*), (*P. anubis*), (*P. cynocephalus*), (*P. kindae*), (*P. papio*), and (*P. hamadryas*), each occupying distinct ecological niches across ecologically variable mosaics that support larger, stable groups with seasonal flexibility [4]. Saudi Arabia harbors only *P. hamadryas*, specialized to arid Sarawat Mountain ecological islands (steep cliffs, <100 mm annual rainfall), where severe dietary and ranging constraints apply [19,22]. Human encroachment differs regionally: African baboons face urban–rural and agricultural edges driving crop raiding and retaliatory responses [23], while Saudi urban expansion penetrates habitats directly, increasing reliance on anthropogenic foods that fuel population growth and urban nuisance behavior [24,25]. Table 2 summarizes species–habitat differences shaping management strategies.

Table 2. Comparative summary of baboon species, geographic ranges, and habitat characteristics across regions.

Baboon Species	Range	Habitat Type	Climate	Ecological Adaptations
Chacma (<i>Papio ursinus</i>)	Southern Africa	Savannah, mountains, woodlands	Varied. seasonal rainfall	Large troops, flexible diet tubers/fruits
Olive (<i>Papio anubis</i>)	Central and East Africa	Savannah, forest edges	Tropical to semi-arid	Opportunistic foraging; large ranging behavior
Yellow (<i>Papio cynocephalus</i>)	East Africa	Savannah, woodlands	Seasonal rainfall	Seasonal movements tied to food availability
Kinda (<i>Papio kindae</i>)	Angola, Congo, and Zambia	Savannah	Tropical wet-dry	Highly frugivorous diet; peaceful social dynamics
Guinea (<i>Papio papio</i>)	West Africa	Forest, savannah	Tropical wet-dry seasons	Smaller groups; arboreal tendencies
Hamadryas (<i>Papio hamadryas</i>)	Red Sea, Arabian Peninsula	Arid mountains, fragmented habitats	Arid; low rainfall (<100 mm/yr)	Specialized cliff refugia, arid-adapted foraging

3.1.2. Governance: Contrasting Models of Policy and Practice

Management approaches reflect differing regional governance, cultural contexts, and ecological realities. African countries predominantly adopt decentralized, community-based frameworks emphasizing coexistence through non-lethal deterrents (noise stimuli, baboon-proof bins), community education, legal protections, and adaptive interventions

grounded in behavioral ecology, though enforcement and resources vary. Saudi Arabia employs a centralized national program (NCW) incorporating AI-processed survey data mapping conflict hotspots, enforcement fines for illegal feeding, field interventions, public education, and ecological restoration.

3.1.3. Adaptation: Behavioral Dynamics Navigating Human-Modified Landscapes

Baboons exhibit behavioral and demographic adaptations to navigate human-modified landscapes, varying across different countries and regions. In Africa, adaptive strategies diverge among the continent's species to match local ecological and anthropogenic pressures [10,23]. For instance, Chacma baboons in Southern Africa manage seasonal rainfall by utilizing a flexible diet of tubers and fruits but readily adjust their spatial use to exploit anthropogenic waste in peri-urban areas. In Central and East Africa, Olive baboons rely on opportunistic foraging and large ranging behaviors, adapting to agricultural expansion by raiding cultivated crops; notably, this behavior peaks during planting and harvesting seasons when natural forage is scarce. Meanwhile, Yellow baboons in East Africa adapt through seasonal movements tied to fluctuating food availability, and Guinea baboons in West Africa display more arboreal tendencies to navigate their forest-savannah habitats. Conversely, Saudi Arabian hamadryas baboons are originally specialized for the arid Sarawat Mountains, utilizing steep cliffs as refugia to cope with severe dietary and ranging constraints (<100 mm annual rainfall). However, driven by habitat fragmentation and a lack of natural predators, they have intensely habituated to humans. They have adapted by shifting their reliance heavily toward urban refuse and direct feeding, resulting in unchecked population growth and conflict incidents, specifically aggression and public health concerns [25]. Ultimately, in both regions, habitat fragmentation combined with urban sprawl compresses natural ranges, amplifying human-baboon interactions and necessitating these drastic behavioral shifts.

3.2. Intersection of Geography, Governance, and Adaptation in Management

Geography, governance, and baboon adaptive behaviors form an integrative framework shaping distinct management outcomes across regions. African baboons benefit from ecological diversity supporting flexible, community-based coexistence strategies, yet outcomes remain constrained by inconsistent enforcement and socio-economic barriers. Saudi Arabia's spatially restricted hamadryas baboons occupy a highly fragmented arid environment managed through centralized, technologically driven interventions that emphasize rapid population control and urban nuisance mitigation. This divergence reflects different conflict landscapes: African contexts feature mosaic conflicts at urban-rural and agricultural interfaces, while Saudi Arabia confronts dense urban conflicts driven by overpopulation and habituation. Decentralized, non-lethal coexistence approaches characterize African management, whereas centralized regulation with technological oversight defines the Saudi strategy, underscoring the importance of context-specific solutions. Regarding management success, comparative evaluations indicate that Africa's community-based, non-lethal programs effectively foster coexistence when consistently applied, though they are frequently constrained by enforcement limitations and socio-economic barriers. Conversely, Saudi Arabia's centralized, technological interventions efficiently control urban populations but require substantial financial investment and face resistance from ingrained public feeding habits. Critical changes are needed in both regions. Management frameworks must move toward integrative, ecosystem-based strategies that address fundamental ecological drivers such as habitat fragmentation and predator loss while combining the technological precision of the Saudi model with the participatory community engagement seen in African programs.

3.3. Patterns, Drivers, and Environmental Contexts of Human–Baboon Conflict

Human–baboon conflict across Africa and Saudi Arabia shows distinct regional manifestations shaped by local ecology and anthropogenic factors. In Africa, conflict predominantly involves crop raiding and property damage along agricultural and urban–wildland edges, driven by farming expansion into primate habitats without adequate buffers. Conflict intensity peaks during planting and harvesting periods when natural forage is scarce [23], and economic threats to rural livelihoods frequently incite retaliatory killings that disrupt troop social structures and complicate management. In Saudi Arabia, conflict centers on urban and peri-urban zones, involving property damage, aggressive encounters, public health risks, and tourism disruption. The absence of natural predators combined with widespread anthropogenic food subsidies has fueled unchecked population growth and intense urban habituation, creating persistent nuisance behaviors distinct from Africa’s seasonal patterns. While habitat alteration underlies conflict in both regions, its expression differs fundamentally: agricultural encroachment in Africa versus waste mismanagement and deliberate feeding in Saudi Arabia, underscoring the need for regionally tailored strategies.

3.4. Integrative Baboon Management Framework

Leveraging comparative analyses from Kenya, South Africa, Ethiopia, and Saudi Arabia, this study develops an integrative framework synthesizing three interactive dimensions: (1) Geography and Habitat—species diversity, habitat fragmentation, climate variability, and resource distribution [4]; (2) Urbanization and Human Encroachment—urban spread, agriculture, anthropogenic food access, and habitat compression shaping conflict intensity [21]; and (3) Social and Management Contexts—human attitudes, governance models, legal frameworks, enforcement capacity, and interventions ranging from non-lethal deterrents to technological mechanisms [11].

3.5. Regional Case Study Applications

South Africa (Cape Peninsula) employs community-led, decentralized management using non-lethal deterrents and public education [11]. Kenya and Ethiopia rely on community engagement and traditional deterrents with potential for technological adoption. Saudi Arabia employs centralized governance with AI-assisted analysis mapping ~36,000 baboons across 561 hotspots, alongside fines, field interventions, and ecological restoration [19,26]. Comparative evaluations indicate that non-lethal community-based programs effectively foster coexistence when consistently applied; centralized technological interventions efficiently control urban populations but require substantial investment; and lethal control offers limited long-term benefit due to social disruption. Together, these findings underscore the need for tailored, integrative approaches that respect both ecological particularities and sociopolitical contexts to foster sustainable coexistence amid accelerating environmental change.

4. Discussion

4.1. Socio-Cultural and Policy Drivers: Africa vs. Saudi Arabia

Socio-cultural values and governance frameworks critically inform baboon management approaches, as summarized in Table 3. Saudi Arabia employs a centralized, government-led model through the National Center for Wildlife (NCW), emphasizing regulatory enforcement, including SAR 500 fines for feeding [19,26] and multi-stakeholder coordination to balance ecological restoration with public safety. In contrast, African cases operate within decentralized, participatory models: South Africa’s Cape Peninsula Baboon Management Program features collaborative efforts among NGOs, scientists, and residents

emphasizing non-lethal deterrents [11,21,27], while Kenyan strategies balance wildlife conservation with agricultural livelihoods through regionally variable community-driven programs. However, these decentralized efforts predominantly rely on localized, low-cost interventions such as noise stimuli, ground observers, and baboon-proof waste management rather than formalized financial support or farmer reimbursement schemes for crop destruction, which remain largely absent due to pervasive funding gaps.

Table 3. Governance Comparison.

Dimension	African Cases	Saudi Arabia
Governance Structure	Decentralized, community-based, participatory	Centralized, NCW-led national program
Primary Tools	Non-lethal deterrents, education, behavioral conditioning	AI mapping (36 K baboons, 561 hotspots), SAR 500 fines, restoration [19,26]
Enforcement	Variable, community-dependent	Robust regulatory, multi-stakeholder coordination
Cultural Context	Diverse attitudes, coexistence emphasis	Public safety, tourism protection focus
Key Limitation	Enforcement capacity, funding	Public resistance to strict measures

To overcome these socio-economic and infrastructural barriers and incorporate the advanced, technology-driven strategies successfully employed in Saudi Arabia, African programs would likely need to leverage international conservation partnerships. Furthermore, Saudi Arabia’s centralized data infrastructure could be adapted into scalable, cost-effective models designed specifically for resource-limited contexts, allowing African nations to gradually integrate AI mapping and remote sensing without bearing the full burden of centralized development.

Implementation success in both contexts depends critically on public compliance. Saudi Arabia’s centralized approach faces resistance from deep-rooted urban feeding habits, requiring continuous education campaigns alongside enforcement [26], while African models encounter enforcement limitations and funding gaps despite fostering community engagement [21]. While specific financial metrics such as the exact cost per nation or cost per managed baboon are currently lacking in comparative literature, there is a clear economic divergence between the regions. Saudi Arabia’s centralized, technology-driven interventions such as extensive AI mapping and ecological restoration require substantial upfront and ongoing investment. In contrast, Africa’s grassroots, community-based strategies are comparatively lower in direct technological costs but frequently encounter significant funding gaps and resource limitations that hinder consistent enforcement. In both regions, public fears regarding aggression and zoonotic diseases shape management support [28]. Effective conservation therefore requires not merely selecting a governance model but adapting it to the specific socio-cultural fabric building trust in community-led African systems or enhancing compliance within Saudi Arabia’s regulatory framework.

4.2. Technology and Engagement: Operational Pathways

Technology and community engagement operationalize baboon management through distinct ecological, social, and governance pathways, as summarized in Table 4. Saudi Arabia’s National Center for Wildlife employs a centralized, data-driven program using AI-processed survey data and remote sensing to map ~36,000 baboons across 561 hotspots, combining digital mapping with anti-feeding enforcement, ecological restoration, and public awareness campaigns [19,26]. Future phases could integrate drones and sensor

networks to forecast conflict hotspots and support pre-emptive interventions [8]. African management in the focal case studies relies primarily on ground observers, GPS collars, camera traps, and baboon-proof waste management [10,15]; a centralized AI infrastructure comparable to Saudi Arabia's national program has not yet been documented in these contexts, reflecting differences in resource availability and institutional governance.

Table 4. Integrative Framework.

Core Dimension	African Case Characteristics	Saudi Characteristics	Management Implications
Geography/Ecology	Multi-species, heterogeneous habitats, seasonal resources	Hamadryas only, fragmented mountains, constant scarcity	Habitat-specific restoration priorities
Governance	Community-led, decentralized	Centralized, tech-enabled	Match intervention scale to institutional capacity
Technology	GPS collars, camera traps, ground observers	AI mapping, remote sensing, future smart-city integration	Resource-appropriate monitoring
Adaptation/Human Behavior	Crop raiding, retaliatory killing	Urban habituation, illegal feeding	Target-specific behavioral interventions
→ INTERACTIONS	Feedback loops: ecology ↔ community tolerance ↔ enforcement	Feedback loops: technology ↔ regulation ↔ public compliance	Adaptive management across all dimensions

Community engagement fulfills distinctive roles in each region. African participatory approaches cultivate tolerance and support non-lethal spatial management [11], while Saudi Arabia leverages engagement to complement enforcement through digital platforms that encourage reporting and promote compliance with feeding regulations [25]. Expanding AI and advanced monitoring into African baboon management could improve data precision and predictive capabilities, though socio-economic and infrastructural barriers to adoption must be identified to guide scalable implementation. While highly effective in its native context, the Saudi centralized model presents significant limitations regarding costs, equity, and transferability. The model relies heavily on substantial capital investments for AI infrastructures, remote sensing, and large-scale ecological restoration, limiting its direct transferability to resource-constrained regions. Furthermore, its top-down governance which utilizes strict enforcement and financial penalties (e.g., SAR 500 fines) could raise severe equity issues if transplanted to rural African contexts. Imposing punitive fines in decentralized, agricultural communities that already suffer profound economic losses from crop raiding, and who lack financial safety nets, risk marginalizing vulnerable populations and exacerbating human–wildlife conflict. Long-term assessments of AI-driven programs' ecological, economic, and social impacts remain limited, and comparative studies across diverse species, habitat types, and governance settings are needed. Therefore, Saudi Arabia's data-driven governance must be viewed critically; it offers a reference model that can complement Africa's rich field experience in socio-ecological coexistence, but only if adapted into equitable, cost-effective, and scalable frameworks rather than direct replication.

4.3. Conservation Effectiveness: Ecosystem-Based Strategies

Saudi Arabia prioritizes ecological restoration—native vegetation recovery, predator reintroduction, and regulated baboon removals—to address habitat fragmentation, resource scarcity, and predator absence [8]. Though slower to yield measurable outcomes, this ecosystem-based approach promotes sustainable population control by realigning

ecosystem functions and reducing anthropogenic food reliance. African programs have historically emphasized faster-acting interventions such as culling, risking troop disruption and spatial conflict displacement. While non-lethal deterrents and community-based coexistence are increasingly prioritized, large-scale habitat restoration remains underdeveloped in reviewed African programs, presenting opportunities to apply the Saudi model's landscape rehabilitation approach.

Furthermore, climate change acts as a significant threat multiplier in human–wildlife conflict, necessitating that EBM strategies incorporate climate resilience. In Africa, shifting seasonal rainfall affects the availability of natural forage, driving adaptable species to increasingly rely on stable anthropogenic food sources during prolonged droughts [14]. Similarly, in Saudi Arabia's harsh Sarawat Mountains, temperature variability and scarce precipitation exacerbate natural resource depletion, pushing hamadryas populations further into urban centers [22]. Achieving climate adaptation requires proactive management strategies, such as restoring drought-resistant native vegetation, securing natural water catchments, and utilizing predictive modeling to forecast climate-driven range shifts before conflict intensifies.

Ecological variability demands tailored strategies: African management must prioritize landscape connectivity and habitat heterogeneity to support broad species distributions [4], while Arabian hamadryas populations require restoration of scarce water sources, vegetation, and natural predators within arid mountain niches. Ecosystem-based management (EBM) addresses root ecological causes rather than episodic conflict symptoms, fostering resilience, natural population control, and community acceptance through multi-stakeholder collaboration. By integrating technologies ranging from field-based GPS collars and camera traps to advanced AI-assisted mapping, remote sensing, and emerging drone and sensor networks with ecological knowledge, EBM enables precise, resource-efficient interventions that balance biodiversity conservation, human safety, and socio-economic realities, principles applicable across diverse socio-ecological contexts.

The integrative SES framework developed here extends beyond baboon management; it is highly generalizable to other adaptable, human-commensal primates such as macaques in Asia or vervet monkeys in Africa that similarly navigate rapidly urbanizing landscapes. By mapping the bi-directional feedback between species ecology, human behavior, and governance, the framework can guide cross-taxa conflict mitigation. However, its primary limitation lies in its heavy reliance on robust socio-economic and behavioral data. Applying this framework to critically endangered or highly specialized primates with low behavioral plasticity, or in regions lacking transparent governance data, may yield limited predictive value, underscoring the need for context-specific data inputs.

5. Conclusions

This review synthesizes ecological, socio-cultural, and management contrasts across African populations (Kenya, South Africa, Ethiopia) and Saudi Arabia's Sarawat Mountains. Saudi Arabia's centralized, technology-driven approach—AI-assisted monitoring of ~36,000 individuals across 561 hotspots and ecological restoration complements decentralized, community-based strategies emphasizing non-lethal deterrents and behavioral conditioning in Africa. Context-specific interventions integrating geography, governance, and adaptation prove essential.

Critical priorities include habitat restoration addressing root causes (predator loss, fragmentation), technological precision (e.g., NCW mapping), and community engagement to reduce anthropogenic habituation. Cross-regional learning opportunities abound: African coexistence expertise informs Saudi urban challenges, while Saudi data infrastructure provides scalable models for resource-limited contexts. Future work must assess

long-term outcomes of integrated ecosystem-based management, technology adoption, and inclusive governance to sustain baboon populations amid expanding human settlement.

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