

Adapting the Tennessee Valley Authority Development Strategies in the 1930s For Cameroon: A Path Towards Health, Food Security, and Economic Transformation

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ABSTRACT

This study explores how development strategies pioneered by the Tennessee Valley Authority (TVA) in the 1930s can be adapted to address Cameroon's ongoing challenges, such as malaria, food insecurity, weak transportation systems, and slow economic growth.

Through historical and comparative analysis, it examines how the TVA used integrated planning combining health initiatives, agricultural reform, electrification, and infrastructure development to transform one of the poorest U.S. regions into a productive economy.

The study argues that Cameroon could achieve similar progress by adopting regional, multi-sectoral frameworks that prioritize local participation, environmental management, and infrastructure modernization to promote sustainable development and self-reliance.

Keywords: Tennessee Valley Authority, New Deal, Sustainable Development, Food Insecurity, Underdevelopment.

INTRODUCTION

This study examines the Tennessee Valley in the early 20th century as one of the poorest and least developed regions in the United States. Stretching across seven states in the American South, the region faced interconnected social and economic hardships¹. widespread malaria, severe soil erosion, recurrent flooding, and limited access to electricity, healthcare, and transportation infrastructure.

As Michael J. McDonald and Muldowny observe, many families lived in conditions comparable to those found in parts of the developing world today². In this respect, the Tennessee Valley of the 1920s bears structural similarities to contemporary regions in Sub-Saharan Africa, including rural Cameroon, where poverty, disease, and environmental degradation reinforce one another.

In response to these conditions, President Franklin D. Roosevelt established the Tennessee Valley Authority (TVA) in 1933 as part of his New Deal³. The TVA pursued an integrated development strategy that combined flood control, electrification, agricultural reform, and industrial expansion within a single institutional

¹ Philip Selznick, *TVA and the Grass Roots: A Study in the Sociology of Formal Organization* (Berkeley: University of California Press, 1949), pp. 3–7;

² Michael J. McDonald and John Muldowny, *TVA and the Dispossessed: The Resettlement of Population in the Norris*

Dam Area (Knoxville: University of Tennessee Press, 1982), pp. 4–9

³ William E. Leuchtenburg, *Franklin D. Roosevelt and the New Deal, 1932–1940* (New York: Harper & Row, 1963), pp.57–62;

framework⁴. Rather than treating these challenges as isolated problems, it approached the region as an interconnected ecological and economic system⁵.

This paper argues that while the TVA represents a historically significant model of state-led regional transformation, its relevance to contemporary Cameroon depends on significant structural differences in governance capacity, fiscal sustainability, and political economy constraints. The purpose of this study is not to recommend policy replication but to analyze the conditions under which an integrated development authority might succeed or fail in a markedly different institutional context.

A Historical Overview of the Tennessee Valley Authority

The outbreak of the Great Depression in the 1930s caused severe economic, environmental, and social challenges.

President Franklin D. Roosevelt's ambitious mandate was determined to address a web of interrelated challenges that had long hindered development in the region⁶. Its mission encompassed four key areas of intervention.

The administration sought to combat endemic diseases, particularly malaria, through environmental engineering, improved drainage systems, and enhanced sanitation measures that reduced mosquito breeding grounds. Also, through agricultural reform, it aimed to restore the fertility of eroded soils, promote crop diversification, and introduce scientific farming methods to increase yields and stabilize rural livelihoods⁷.

Moreover, in terms of infrastructure development, they embarked on an extensive program of dam construction along the Tennessee River and its tributaries, not only to control flooding and improve navigation but also to generate hydroelectric power that would electrify rural areas and attract new industries⁸. F.D.

Roosevelt's administration also pursued economic growth more broadly by fostering industrial development, expanding educational opportunities, and creating employment programs that helped lift thousands of families out of poverty⁸.

Scholars have long debated the significance and legacy of the TVA. Philip Selznick, in *TVA and the Grass Roots*, portrayed the agency as an innovative yet complex experiment in "democratic planning," one that sought to balance centralized federal authority with active community participation¹⁰.

Similarly, Ernest Erber emphasized its pioneering role in demonstrating how large-scale public institutions could integrate economic, social, and environmental objectives within a single regional framework. Both scholars recognized that the TVA's success derived from its holistic vision, treating the Tennessee Valley not as a set of isolated problems, but as a dynamic ecological and economic system requiring coordinated, longterm management¹¹.

⁴ Eric Forner, *Rural Development and the TVA Model* (Chapel Hill: University of North Carolina Press, 2005), pp. 22–

30;

⁵ *Ibid*, 2005), pp.28–35;

⁶ Selznick, *TVA and the Grass Roots*: 1949), 3–7; Anthony J. Badger, *The New Deal: The Depression Years, 1933–1940* (New York: Hill and Wang, 1989), 87–90; David E. Lilienthal, *TVA: Democracy on the March* (New York: Harper & Brothers, 1944), 1–5.

⁷ Badger, *The New Deal*, 1989), pp. 92–95; ⁸

Badger, *The New Deal*, 1989), pp.96–101

⁸ Erwin C. Hargrove and Paul K. Conkin, *The TVA: Fifty Years of Grass-Roots Bureaucracy* (Urbana: University of Illinois Press, 1983), 59–78;

This systems-based approach became a model for later development programs worldwide, influencing strategies for regional planning in both developed and developing nations, with scholarly contributions emerging from various angles.

Historiographical Reflection of the Tennessee Valley Authority

The Tennessee Valley Authority has long held a central place in debates about the state's role in economic development, and it has been examined through various historiographical lenses. Early postwar scholars often portrayed the TVA as a technocratic triumph, a model of rational planning and effective government intervention.

Writers such as David Lilienthal, one of the TVA's own directors, celebrated it as a symbol of American ingenuity and democratic modernization, where science and expertise were mobilized to serve the public good¹². From this perspective, the TVA embodied the optimism of mid-20th-century developmentalism: the belief that coordinated state planning could overcome poverty and backwardness through technology, infrastructure, and social reform.

By the 1970s and 1980s, however, revisionist historians and environmental critics began to question this celebratory narrative. Adams H.

William argued that the TVA's achievements came at a high ecological and social cost, including the displacement of communities, the flooding of fertile valleys, and the loss of biodiversity¹³. Others pointed to the dangers of bureaucratic centralization that a highly technocratic agency, while efficient, could stifle local participation and concentrate decision-making power in distant institutions⁹. Yet even among its critics, there was broad agreement that the TVA represented a transformational experiment in regional planning, one that fundamentally reshaped the relationship between state, environment, and society.

The historiographical consensus that has since emerged recognizes the TVA as both an achievement and a cautionary tale: a pioneering example of how large-scale development can succeed materially while raising complex questions about governance, equity, and sustainability.

In the African context, the TVA's influence extended far beyond U.S. borders. Post-independence leaders and planners across the continent looked to it as a model for state-led modernization. Notable examples include Ghana's Volta River Project in the 1960s, which sought to combine hydroelectric generation with industrialization and rural uplift¹⁵, and Nigeria's Niger Delta Development Commission (NDDC), established to promote integrated regional development in a resource-rich but impoverished region. However, unlike the TVA, these initiatives often faltered due to weak governance structures, corruption, and limited community engagement¹⁶. The disconnect between centralized planning and local participation meant that projects frequently prioritized infrastructure delivery over social inclusion, resulting in uneven benefits and persistent regional discontent.

¹⁰ Selznick, *TVA and the Grass Roots*, 1949), 3–9, 27–33.

¹¹ Ernest Erber, *The Tennessee Valley Authority: A Case Study in Public Planning* (Washington, DC: Public Affairs Press, 1962), 11–18, 64–70;

¹² David E. Lilienthal, *This I Do Believe* (New York: Harper & Brothers, 1953), 53–60.

¹³ William H. Adams, *The TVA and the Dispossessed: The Impact of Federal Development on Local Communities* (New York: Praeger, 1980), 45–52, 88–94

⁹ Erwin C. Hargrove and Paul K. Conkin, *The TVA: Fifty Years of Grass-Roots Bureaucracy* (Urbana: University of Illinois Press, 1983), 81–95

From a critical theoretical perspective, scholars such as James C. Scott have warned against the dangers of

“high-modernist” state planning that prioritizes technical abstraction over local knowledge. In *Seeing Like a State*, Scott argues that large-scale development schemes often fail when centralized authorities impose standardized solutions without sufficient attention to local social realities¹⁷. While the TVA achieved measurable economic gains, its technocratic structure also raises questions about democratic participation, displacement, and the concentration of decision-making power.

This critique complicates purely celebratory interpretations of the TVA. Its legacy can be understood not only as a triumph of coordinated planning but also as an example of the tensions inherent in state-led modernization. For contemporary Cameroon, this historiographical debate underscores the importance of balancing technocratic expertise with participatory governance mechanisms that safeguard accountability and local agency.¹⁰

Adapting the Tennessee Valley Development Strategies for Cameroon

Although the Tennessee Valley and contemporary Cameroon are parallel, there are compelling, important structural contrasts that complicate direct comparison. The TVA operated within a consolidated federal system characterized by relatively strong bureaucratic capacity, institutional continuity, and access to deep domestic capital markets. Congressional oversight and federal financing mechanisms provided both legitimacy and longterm fiscal stability.

On the other hand, Cameroon operates within a markedly different political economy. Administrative capacity remains uneven across regions, fiscal resources are constrained, and large-scale infrastructure projects often depend on external financing or bilateral partnerships. Moreover, centralized executive authority may limit the institutional autonomy necessary for a development agency to function effectively and transparently¹¹.

Whereas the TVA benefited from a relatively coherent federal-state relationship, Cameroon's governance framework faces greater coordination challenges between national ministries, regional authorities, and local communities¹².

Historically, the Tennessee Valley suffered some of the highest malaria infection rates in the United States in the 1920s and 1930s before the introduction of the TVA¹³. The region's hot, humid climate, combined with

¹⁵ James C. Scott, *Seeing Like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven: Yale University Press, 1998), 223–261, on TVA-inspired high-modernist planning abroad; Akosua Perbi, *A History of Indigenous Slavery in Ghana* (Accra: Sub-Saharan Publishers, 2004), 198–201, for post-independence modernization ambitions; Kwame Nkrumah, *I Speak of Freedom* (London: Heinemann, 1961), 170–176, on the Volta River Project as a symbol of national development; M. S. B. Johnson, “The Volta River Project in Ghana,” *Geographical Review* 55, no. 1 (1965): 85–102.

¹⁶ Cyril I. Obi, *The Niger Delta: A Study in the Political Economy of Violence* (New York: Routledge, 2010), 72–85 ¹⁷ Scott, *Seeing Like a State*, 1998), 223–261

¹⁰ World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 43–65

¹¹ World Bank, *Cameroon Public Expenditure Review* (Washington, DC: World Bank, 2018), 23.

¹² 20 Ibid, pp, 45.

¹³ David E. Lilienfeld, “Malaria Eradication in the Tennessee Valley,” *Public Health Reports* 85, no. 5 (1970): 413–420;

²² Ibid.

widespread deforestation and stagnant pools of water left by poor drainage and flooding, created ideal breeding grounds for mosquitoes²², as seen in Cameroon and other sub-Saharan African countries. Also, many farming communities were trapped in a vicious cycle: ill health reduced labor productivity, which in turn deepened poverty and limited the capacity for local governments to invest in public health infrastructure¹⁴.

Recognizing the interdependence between environmental conditions and human well-being, the TVA launched an ambitious program of environmental engineering¹⁵. This included draining swamps, regulating water levels through dam operations, lining canals to prevent stagnation, and clearing vegetation along waterways. Complementary initiatives such as improving rural housing, screening windows, and expanding access to public health education further enhanced community resilience. By the 1940s, coordinated environmental management served as a powerful tool for disease control and rural development¹⁶.

This study, therefore, contends that adopting the TVA's integrated development approach could benefit Cameroon. Unlike the Tennessee Valley region, malaria continues to be endemic in Cameroon, contributing substantially to outpatient consultations and childhood mortality, especially in rural and flood-prone communities¹⁷.

A TVA-inspired model highlights the importance of integrating public health into infrastructure and agricultural planning. Hydrological projects such as dams and irrigation systems can be strategically designed to minimize stagnant water and reduce mosquito breeding, thereby linking environmental management to disease control. Additionally, embedding trained local public health personnel within rural development initiatives would strengthen coordination among engineers, agronomists, and health professionals, ensuring that sanitation and vector control are treated as core components of development rather than secondary concerns. Moreover, existing regional development authorities, such as SEMRY (Société d'Expansion et de

Modernisation de la Riziculture de Yagoua) and SODECOTON (Société de Développement du Coton du Cameroun),¹⁸ could serve as institutional vehicles for integrating agricultural irrigation schemes with environmental health interventions.

This kind of alignment between infrastructure planning and public health policy would not only reduce malaria transmission but also yield long-term socio-economic benefits by improving agricultural productivity, enhancing labor capacity, and reducing healthcare costs²⁸. In essence, Cameroon could replicate the TVA's success by viewing disease prevention not merely as a medical issue, but as a fundamental component of sustainable regional development.

Another important area of concern is Food security, which has been a remarkable and enduring achievement by the TVA after the 1930s through its comprehensive program for agricultural modernization²⁹. Before the TVA's intervention, decades of deforestation, overgrazing, and unsustainable farming practices had left the valley's soils severely eroded and unproductive. Many farmers struggled to grow enough to feed their families, and recurrent floods and droughts compounded their vulnerability³⁰.

Recognizing that economic revitalization was impossible without restoring the land's productivity, the TVA launched a coordinated effort to transform regional agriculture through science-based innovation and farmer

¹⁴ Ibid

¹⁵ Tennessee Valley Authority, *Health and Sanitation in the Tennessee Valley: A Progress Report* (Knoxville: Tennessee Valley Authority, 1944), 12–18.

¹⁶ Ibid.

¹⁷ World Health Organization, *World Malaria Report 2023* (Geneva: WHO, 2023), 68–70.

¹⁸ Samuel F. Fokam, "State-Led Irrigation and Rice Development in Northern Cameroon: The SEMRY Experience," *Journal of Modern African Studies* 44, no. 3 (2006): 429–432.

education. It introduced soil conservation techniques such as contour plowing, terracing, and reforestation to prevent erosion and restore natural fertility³¹.

The TVA also promoted crop diversification, encouraging farmers to move away from exhaustive monocultures like cotton and to adopt more sustainable rotations involving legumes, grains, and forage crops. Furthermore, its pioneering work in fertilizer research and production, notably through the development of phosphate-based fertilizers, helped replenish depleted soils and significantly increase crop yields. These reforms not only improved food security but also laid the foundation for a more stable and prosperous rural economy.¹⁹

Similarly, agriculture remains the backbone of Cameroon's economy, employing over 60% of the population and contributing significantly to the national GDP²⁰. Yet, productivity across much of the country is constrained by poor soil fertility, limited access to modern inputs, high post-harvest losses, and minimal mechanization²¹.

According to a report from the Food and Agriculture Organization (FAO), many smallholder farmers still rely on traditional methods that cannot sustain growing populations or withstand the impacts of climate variability²². Drawing lessons from the TVA's integrated agricultural strategy, Cameroon could adopt a multidimensional approach that links research, education, and community participation.

²⁸ World Health Organization, *World Malaria Report 2023* (Geneva: WHO, 2023), 32–35

²⁹ Erwin C. Hargrove and Paul K. Conkin, *TVA: Fifty Years of Grass-Roots Bureaucracy* (Urbana: University of Illinois Press, 1983), 92–99.

³⁰ Donald Worster, *Rivers of Empire: Water, Aridity, and the Growth of the American West* (New York: Pantheon, 1985), 205–210.

³¹ Tennessee Valley Authority, *Soil Conservation and Agricultural Adjustment in the Tennessee Valley* (Knoxville: TVA, 1936), 15–22.

The government of Cameroon could establish regional soil and crop research centers, modeled after the TVA's agricultural experiment stations, to develop location-specific solutions for soil restoration, fertilizer formulation, and climate-resilient crops. Also, it could expand community-based agricultural extension services that would allow trained specialists to work directly with farmers, teaching modern farming techniques, sustainable land management, and post-harvest handling practices. Moreover, strengthening cooperative organizations could enhance access to storage facilities, processing technologies, and market networks, helping smallholders obtain fairer prices and reduce post-harvest losses³⁶.

By combining scientific agriculture with active community participation, Cameroon could not only boost productivity but also build greater resilience against environmental shocks and economic volatility³⁷. In the long term, such a TVA-inspired agricultural transformation would strengthen food security, raise rural incomes, and

¹⁹ Tennessee Valley Authority, *Agricultural Development in the Tennessee Valley* (Knoxville: TVA, 1941), 22–29.

²⁰ World Bank, *Cameroon Economic Update* (Washington, DC: World Bank, 2022), 14.

²¹ World Bank, *Cameroon Economic Update: Strengthening Agricultural Productivity* (Washington, DC: World Bank, 2022), 12–18.

²² Food and Agriculture Organization (FAO), *The State of Food and Agriculture: Leveraging Food Systems for Inclusive Rural Transformation* (Rome: FAO, 2017), 34–38.

contribute to inclusive national development, demonstrating how coordinated, evidence-based planning can turn subsistence farming into a driver of sustainable growth.

Also important is Transport modernization. It was another of the TVA's transformative achievements, which was its overhaul of the region's transportation and infrastructure systems, fundamentally reshaping the economic geography of the American South³⁸. Before the TVA's intervention, the Tennessee Valley was largely cut off from national markets due to treacherous river conditions, seasonal flooding, and the absence of reliable transportation networks²³.

The Tennessee River, though central to the region's identity, was shallow, obstructed by shoals, and unnavigable for long stretches, isolating rural communities and limiting trade. Through an ambitious program of dam and lock construction, the TVA transformed this once-fragmented river system into a navigable waterway stretching more than 650 miles²⁴. By stabilizing water levels and controlling floods, the Authority enabled year-round navigation, linking remote farming and mining areas to major urban and industrial centers downstream, including the Mississippi River system²⁵.

This modernization had far-reaching economic implications. Reliable transportation reduced freight costs, attracted industries to the valley, and encouraged the growth of regional trade networks. The new waterways also supported hydroelectric power generation, fueling the expansion of manufacturing, and creating jobs in both construction and industry. In effect, the TVA turned natural barriers into engines of growth, demonstrating how infrastructure integration, combining transportation, energy, and environmental management, could catalyze regional development and connectivity²⁶.

Cameroon, though geographically different, faces a similar challenge of spatial and economic isolation, especially in its rural hinterlands. Many agricultural regions remain disconnected from ports, cities, and processing centers due to poor road infrastructure, high transport costs, and underdeveloped river systems⁴³. Drawing inspiration from the TVA model, the Cameroonian government could adopt an integrated infrastructure strategy that aligns energy generation, water management, and transport planning. It could develop multi-purpose hydroelectric and navigational projects along major rivers such as the Sanaga and Benue.

By combining dam construction with navigational improvements, Cameroon could enhance both electricity access and river-based transport, reducing pressure on road networks while promoting regional trade. Also, the establishment of regional development corridors linking agricultural zones to industrial centers and export ports would stimulate value-chain integration, attract investment, and foster balanced regional growth.

³⁶ FAO. *The State of Food and Agriculture 2014: Innovation in Family Farming*. Rome: Food and Agriculture Organization of the United Nations, 2014, pp. 92–95.

³⁷ Robert Chambers, *Rural Development: Putting the Last First* (London: Longman, 1983), 145–152.

³⁸ Tennessee Valley Authority. *The Tennessee Valley Authority: A National Experiment in Regional Development*.

Knoxville: TVA, 1944, pp. 73–78.

²³ Erwin C. Hargrove and Paul K. Conkin, *TVA: Fifty Years of Grass-Roots Bureaucracy* (Urbana: University of Illinois Press, 1983), 34–42.

²⁴ Tennessee Valley Authority, *Navigation and Flood Control in the Tennessee Valley* (Knoxville: TVA, 1933), 9–17.

²⁵ Tennessee Valley Authority, *Navigation and Flood Control in the Tennessee Valley* (Knoxville: TVA, 1933), 18–27.

²⁶ Tennessee Valley Authority, *Electric Power Development in the Tennessee Valley* (Knoxville: TVA, 1940), 3–12.

Moreover, prioritizing labor-intensive road rehabilitation projects would not only improve rural mobility but also create much-needed employment opportunities, echoing the TVA's success in combining infrastructure development with social welfare²⁷.

By pursuing this kind of multi-sectoral infrastructure approach, Cameroon could transform physical connectivity into a driver of inclusive development. Just as the TVA's dams and waterways helped lift the Tennessee Valley out of isolation and poverty²⁸, A similar integrated effort could enable Cameroon to bridge its internal divides, unlock regional potential, and build a more cohesive and dynamic national economy²⁹.

Perhaps the most far-reaching legacy of the Tennessee Valley Authority was its role in catalyzing economic transformation through electrification. Before the TVA, the Tennessee Valley lagged behind the rest of the United States in access to power; few rural households were connected to any grid, and industries were scarce due to high energy costs. By harnessing the region's vast hydropower potential, the TVA constructed a network of dams and power plants that supplied cheap, reliable electricity to homes, farms, and factories across seven states³⁰. This new access to energy revolutionized daily life: rural families could refrigerate food, power radios and lights, and use electric tools that eased domestic labor.

At the same time, electricity enabled mechanization in agriculture, boosting productivity and reducing dependence on manual labor. More importantly, it provided the foundation for industrial diversification, attracting aluminum plants, fertilizer factories, and manufacturing firms to previously underdeveloped areas³¹. The TVA thus demonstrated how strategic investment in public energy infrastructure could stimulate broadbased economic growth, reduce regional inequalities, and modernize both industry and society.

In contemporary Cameroon, electricity access remains a major constraint on economic development. While roughly 65% of the population has access to power, this figure drops drastically in rural areas, where electrification rates often fall below 30%. The resulting energy divide reinforces regional disparities, limits job creation, and constrains value addition in agriculture and manufacturing³². A TVA-inspired strategy could therefore provide a powerful framework for transforming Cameroon's energy landscape and industrial potential.

Cameroon could expand its hydroelectric capacity through carefully planned and environmentally sustainable dam projects along rivers such as the Sanaga, the River Mongo, the River Chede in Kupe-Muaneguba, and the Nyong. By incorporating modern ecological safeguards such as fish passages, reforestation programs, and sediment management, these projects could balance energy production with environmental preservation.

Also, the government could encourage industrial clustering around energy hubs, promoting local industries such as agro-processing, textiles, and construction materials to operate near power-generating sites. This spatial concentration of industries would reduce energy transmission losses, create localized job markets, and enhance regional competitiveness.

Moreover, accompanying these investments with technical education and vocational training programs would be essential for building the human capital required to sustain new industries³³. Establishing regional training

²⁷ African Development Bank (AfDB), *Cameroon Transport Sector Strategy Paper 2020–2030* (Abidjan: AfDB, 2020), 19–24.

²⁸ Arthur E. Morgan, *The Making of the TVA* (Buffalo: Prometheus Books, 1974), 170–178.

²⁹ World Commission on Environment and Development, *Our Common Future* (Oxford: Oxford University Press, 1987), 43–60.

³⁰ Tennessee Valley Authority, *Electric Power Development in the Tennessee Valley* (Knoxville: TVA, 1940), 13–22.

³¹ Tennessee Valley Authority, *Electric Power Development in the Tennessee Valley* (Knoxville: TVA, 1940), 23–31.

³² African Development Bank (AfDB), *Cameroon Energy Sector Policy Note* (Abidjan: AfDB, 2021), 6–13.

³³ African Development Bank, *Industrialization Strategy for Africa 2016–2025* (Abidjan: AfDB, 2016), 38–44.

centers focused on electrical engineering, renewable energy maintenance, and industrial mechanics would empower local communities to participate directly in and benefit from the electrification process³⁴.

By integrating energy expansion, industrial policy, and human capital development, Cameroon could emulate the TVA's success in using electricity not merely as a utility but as a catalyst for structural transformation. In doing so, it would lay the groundwork for inclusive, sustainable industrialization, turning light into opportunity and power into progress.

CONCLUSION

The Tennessee Valley Authority remains one of the most significant experiments in integrated regional development of the twentieth century. By linking public health, agricultural reform, electrification, transportation, and industrial policy within a unified institutional framework, it demonstrated how coordinated state intervention can address structurally embedded poverty.

Yet the TVA's historical success does not automatically guarantee its transferability. Its effectiveness rested on specific political, fiscal, and administrative conditions that may not be fully present in contemporary

Cameroon. The central analytical question, therefore, is not whether Cameroon should replicate the TVA, but whether the institutional and fiscal foundations necessary for such an approach can be constructed.

For Cameroon, the enduring lesson of the TVA lies less in its dams or engineering feats than in its systems-based philosophy: development is most effective when economic productivity, environmental stewardship, and social welfare are treated as interdependent. However, sustainable adaptation would require participatory governance, fiscal discipline, and institutional reform. Only under such conditions could an integrated development model contribute meaningfully to inclusive and democratic transformation.

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³⁴ International Renewable Energy Agency (IRENA), *Renewable Energy and Jobs: Annual Review 2023* (Abu Dhabi: IRENA, 2023), 54–60.

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