



Building A Sustainable Athlete Development System: Solutions For Long-Term Achievement

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Abstract. This article examines the concept and implementation of a sustainable athlete development system as a strategic framework for achieving long-term national sporting success. Grounded in established models such as Long-Term Athlete Development (LTAD), FTEM, and Athletic Talent Development Environment (ATDE), the study highlights key challenges in current coaching practices, including short-term performance orientation, early specialization, fragmented policies, and limited integration of sports science. It discusses the importance of early talent identification, integrated coaching structures, data-driven evaluation, and continuous system improvement. Furthermore, the paper contextualizes these principles within Indonesian sports policies, particularly the National Sports Grand Design (DBON) and recent ministerial regulations. The findings underscore that a holistic, evidence-based, and multi-stakeholder approach is essential for producing sustainable athletic achievement and athlete well-being across generations.

Keywords: Sustainable athlete development, Long-Term Athlete Development (LTAD), talent identification, sports policy, evidence-based coaching.

1 Introduction

The pursuit of long-term sporting success requires systematic and sustainable athlete development strategies rather than short-term performance-driven programs. Many national sports systems prioritize immediate competition results, which leads to fragmented training programs, inconsistent athlete pipelines, and limited post-career athlete welfare [1]. Early specialization, insufficient integration of sports science, and weak institutional coordination further exacerbate these challenges [2]-[3].

International frameworks such as the Long-Term Athlete Development (LTAD) model, Developmental Model of Sport Participation (DMSP), and FTEM framework emphasize structured, age-appropriate, and athlete-centered development pathways. In Indonesia, the National Sports Grand Design (DBON) and recent ministerial regulations have initiated a paradigm shift toward sustainable development [4]. However, empirical and conceptual studies indicate that implementation gaps remain significant at the regional and grassroots levels [5].

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This paper aims to (1) analyze key concepts and challenges in sustainable athlete development, (2) examine the Indonesian policy context, and (3) propose strategic recommendations for building a sustainable athlete development system based on international best practices and national policy frameworks.

2 Method

This study employed a qualitative conceptual and document analysis approach. International scientific literature on athlete development models, talent identification, coaching systems, and sports management was systematically reviewed. Policy documents related to Indonesian sports development, including the National Sports Grand Design (DBON) and Ministerial Regulations on LTAD, were analyzed to identify alignment with global frameworks [6].

The data were analyzed using thematic content analysis to identify core themes, including development pathways, institutional structures, sports science integration, and evaluation mechanisms. The synthesis of theoretical models and policy documents was used to construct a conceptual framework for a sustainable athlete development system.

3 Results and Discussion

3.1 Concept of Sustainable Athlete Development

Sustainable athlete development is defined as a long-term, structured, and interconnected process spanning early talent identification, skill development, elite performance, and post-career transition. Core principles include continuity across age stages, progressive training, athlete-centered development, and evidence-based coaching. Models such as DMSP, LTAD, FTEM, and ATDE highlight the importance of early diversification, gradual specialization, and supportive social environments [7].

3.2 Benefits of a Sustainable Development System

A sustainable development system ensures a continuous pipeline of elite athletes, reduces injury and burnout risks, optimizes long-term investment in sports infrastructure, and promotes lifelong participation in physical activity. Such systems contribute not only to elite performance but also to public health and social development [8].

3.3 Implementation in the Indonesian Context

Indonesia has adopted strategic policies to support sustainable athlete development, including the National Sports Grand Design (DBON) and Ministerial Regulation No. 11 of 2024 on LTAD [9]. These policies emphasize integrated development pathways between schools, clubs, and training centers. However, regional implementation remains fragmented due to limited coordination, inconsistent funding, and insufficient sports science integration [10].

3.4 Early Talent Identification and Development

Early talent identification is a critical component of sustainable development. Scientific and data-driven identification methods should replace subjective selection practices [11]. Multilateral development during childhood enhances fundamental motor skills and intrinsic motivation [12]. Schools, sports clubs, and academies play complementary roles in talent discovery and development. Technological tools such as wearable sensors and performance monitoring systems provide objective data for individualized training and injury prevention [13].

3.5 Coaching Structure and Management

An integrated coaching structure involving government agencies, sports federations, schools, and clubs is essential. Clear governance structures, centralized databases, and systematic communication mechanisms prevent program duplication and development gaps. Athlete Management Systems (AMS) and digital reporting platforms support transparency, accountability, and evidence-based decision-making [6].

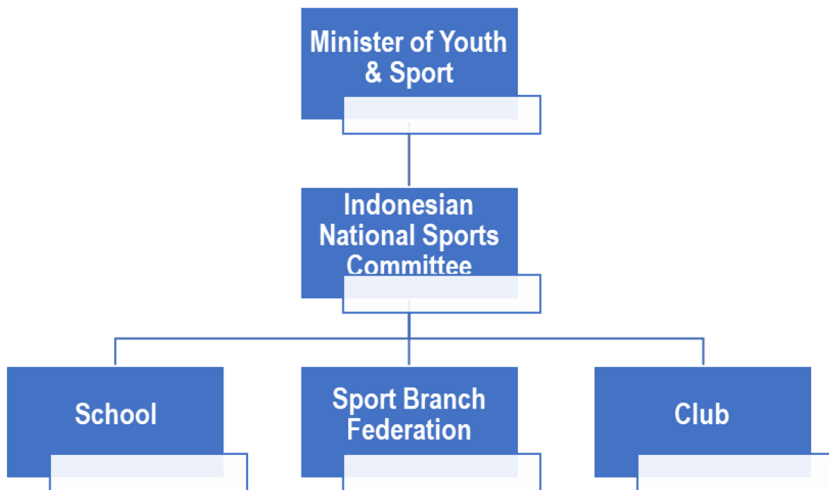


Fig 1. Coaching Structure and Management

3.6 Evaluation and Continuous Improvement

Continuous evaluation of athlete performance and coaching effectiveness is essential for sustainable development. Data-driven evaluation systems enable personalized training, performance monitoring, and injury risk prediction. Adaptive evaluation mechanisms ensure that development programs remain aligned with advances in sports science and technology [14].

3.7 Strategic Framework for Sustainable Development

Key strategies include policy harmonization, integration of sports science and technology, capacity building for coaches and support staff, and structured evaluation systems. A feedback-loop mechanism ensures continuous improvement and system adaptability.

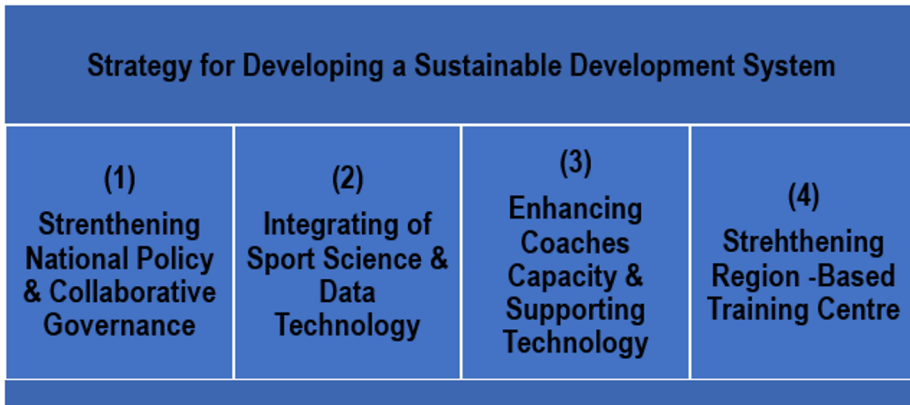


Fig 2. Strategy for Building a Sustainable Athlete Development System

4 Conclusion

A sustainable athlete development system is a strategic foundation for long-term national sporting success. Integrating international development models, national policy frameworks, and evidence-based coaching practices can create a holistic and adaptive development pathway. Strong institutional collaboration, technological innovation, and continuous evaluation are essential for ensuring sustainable athletic achievement and athlete welfare. With consistent implementation, Indonesia has significant potential to develop a globally competitive and sustainable sports development ecosystem.

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