Chapter 9
Leveraging Token Economies for Public Goods

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ABSTRACT

Token economies offer a transformative solution to the enduring challenges of funding and coordinating public goods. Through blockchain-enabled mechanisms such as smart contracts, decentralized governance, and incentive-aligned tokens, communities can address traditional market failures in the provision of non-rivalrous and non-excludable resources. This chapter explores the theoretical foundations of public goods economics, analyzes innovative funding models like quadratic funding, retroactive public goods funding, augmented bonding curves, and emerging regenerative finance systems, and examines how blockchain-based systems can support decentralized, transparent, and scalable public goods provisioning. Drawing on real-world case studies, the chapter evaluates the strengths and limitations of token economies in this domain, highlighting both the promises and the complexities of decentralized coordination.

1. INTRODUCTION

Public goods are the resources or services that are non-excludable and non-rivalrous. They are fundamental to societal well-being, yet have long suffered from chronic underinvestment due to market failures. Traditional funding for public goods relies on government taxation or philanthropy, but these mechanisms often

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fall short, leaving critical needs underprovisioned. In recent years, the emergence of token economies has opened novel pathways for incentivizing and financing public goods. Tokenization allows the creation of digital assets and economic systems that can align individual incentives with collective benefit, offering a transformative approach to funding open-source software, climate stability, scientific knowledge, and other public goods.

This chapter provides an in-depth exploration of how token economies can address the public goods funding problem. It begins by outlining the characteristics of public goods and the problem of underprovision, followed by an overview of token economies as a novel framework for aligning individual incentives with collective outcomes. The chapter then examines key token-based funding models, including quadratic funding, retroactive public goods funding, augmented bonding curves, and regenerative finance (ReFi), detailing their mechanisms and real-world implementations. In addition, it addresses critical challenges, including governance vulnerabilities, regulatory ambiguity, and the influence of speculative market dynamics. The chapter concludes with a forward-looking discussion on the potential of token economies to scale global public goods funding, presenting both the opportunities and limitations of this emerging field at the intersection of blockchain economics and the public interest.

2. PUBLIC GOODS AND THE PROBLEM OF UNDERPROVISION

In economic terms, public goods are goods that are non-excludable (no one can be prevented from using them) and non-rivalrous (one person's use does not reduce availability to others) (Samuelson, 1954; Olson, 1965). Classic examples include clean air, national defense, basic scientific research, open-source software, and public knowledge. In the digital era, this category has expanded to include open-source software, open data, and internet infrastructure, resources that are essential yet remain systematically underfunded.

The core challenge lies in the free-rider problem. Because people can benefit from public goods without paying, markets left to themselves tend to undersupply these goods. Rational individuals have an incentive to "free ride," expecting others to contribute, leading to outcomes where everyone benefits but too few are willing to fund provision (Marwell & Ames, 1979; Andreoni, 1988; Benkler, 2002). As a result, public goods often suffer from chronic underinvestment or complete market failure in private markets (Hardin, 1968).

Historically, governments and philanthropic institutions have attempted to fill this gap. Governments use taxation and hierarchical budgeting processes or establish property rights where possible (turning a public good into a private good), while