Key challenges and approaches to addressing barriers in forest carbon offset projects

Chunyu Pan[1,2], Anil Shrestha[1,2], John L. Innes[1,2], Guomo Zhou[2], Nuyun Li[3], Jinliang Li[3], Yeyun He[3], Chunguang Sheng[4], John-O. Niles[5] & Guangyu Wang[1,2*]

(1 Faculty of Forestry, University of British Columbia, Vancouver, BC V6T 1Z4, Canada; 2 Zhejiang Prov Key Lab of Carbon Cycling Forest Ecosystem, Zhejiang A&F University, Linan 311300, China; 3 China Green Carbon Foundation, Beijing 100714, China; 4 College of Economics and Management, Northeast Forestry University, Harbin 150040, China; 5 University of California, San Diego, San Diego, CA 92093, USA)

Abstract: Forest carbon offset (FCO) projects play an increasingly important role in mitigating climate change through market mechanisms in both compliance and voluntary markets. However, there are challenges and barriers to developing an FCO project, such as carbon leakage and cost-effectiveness. There have been few attempts to summarize and synthesize all types and aspects of existing challenges and possible solutions for FCO projects. This paper systematically reviews and discusses the current challenges involved in developing FCO projects, and then draws on the experience and lessons of existing projects to show how those challenges were addressed in world-leading voluntary carbon standards, namely the Verified Carbon Standard, the American Carbon Registry, the Climate Action Reserve, and Plan Vivo. These voluntary markets have rich experience in FCO projects and are responsible for a significant share of the market. From the 53 publications used in this analysis, three broad thematic categories of challenges emerged. These were related to methodology, socio-economic implications, and implementation. Methodological challenges, particularly additionality, permanence, and leakage, were the focus of 46% of the selected research papers, while socio-economic challenges, including transaction, social, and opportunity costs, were addressed by 35%. The remaining 19% of the research articles focused on implementational challenges related to monitoring, reporting, and verification. Major voluntary standards adequately addressed most of the methodological and implementational barriers by adopting various approaches. However, the standards did not adequately address socio-economic issues, despite these being the second most frequently discussed theme in the papers analyzed. More research is clearly needed on the socio-economic challenges involved in the development of FCO projects. For the development of high-quality forestry carbon offset projects, there are many challenges and no simple, universal recipe for addressing them. However, it is crucial to build upon the current science and move forward with carbon projects which ensure effective, long-term carbon sinks and maximize benefits for biodiversity and people; this is particularly important with a growing public and private interest in this field.

林业碳汇项目中的关键挑战及其解决方法

潘春豫[1,2]，Anil Shrestha[1,2]，John Innes[1,2]，周国模[2]，李怒云[3]，李金良[3]，何业云[3]，盛春光[4]，John-O Niles[5]，王光玉[1,2*]

（[1]不列颠哥伦比亚大学林业学院，加拿大温哥华 V6T 1Z4；[2]浙江农林大学浙江省森林生态系统碳循环与固碳减排重点实验室，浙江临安 311300；[3]中国绿色碳汇基金会，中国北京 100714；[4]东北林业大学经济与管理学院，黑龙江哈尔滨 150040；[5]加州大学圣地亚哥分校，美国圣地亚哥 92093）

摘要：随着全球气候变化问题日益严重，林业碳汇项目在通过市场机制减轻气候变化的作用日益凸显，其在强制性市场和自愿市场中均具有重要意义。然而，在开发和实施项目过程中，我们面临许多挑战和障碍，如碳泄漏、成本效益等。为此，我们试图通过全面的文献回顾和综合分析，总结并梳理这些挑战，以及可能的解决方案。在本研究中，我们系统性地回顾和讨论了开发林业碳汇项目中的当前挑战，并从世界领先的自愿碳标准中挖掘经验和教训，以了解如何解决这些挑战。我们主要关注的自愿碳市场包括 Verified Carbon Standard、American Carbon Registry、Climate Action Reserve 和 Plan Vivo。这些市场在碳汇项目实施中积累了丰富的经验，同时也在全球碳市场中占据了重要的份额。从我们分析的 53 篇出版物中，我们发现林业碳汇项目面临的挑战主要集中在三个广泛的主题类别，即方法学、社会经济影响和实施过程。其中，方法学挑战，尤其是额外性、永久性和泄漏问题，占据了 46％的研究论文。社会经济挑战，包括交易成本、社会成本和机会成本等问题，被 35%的研究论文所关注。剩下的 19%的研究文章集中在与监测、报告和核证有关的实施挑战。尽管主要的自愿标准通过采取多元化的方法，有效地解决了大部分的方法学和实施障碍，然而社会经济问题是在研究中被频繁讨论的第二大主题，这些标准在处理社会经济问题上的解决策略仍然不足。研究表明，我们在开发林业碳汇项目中仍然需要更多的研究来解决社会经济挑战。在开发高质量的林业碳汇项目过程中存在诸多挑战，我们没有简单、普遍适用的解决策略。我们可以明确的是，我们需要建立在当前科学研究的基础上，推动实施能够保证有效、长期碳汇，同时最大化生物多样性和人类福祉的碳汇项目。随着大众和个人对此领域的兴趣日益增长，这个目标显得尤为重要。因此，我们期待未来能有更多的研究深入这一领域，为我们解决林业碳汇项目的挑战提供更多的思路和方向。