



Sustainable development and the water–energy–food nexus: A perspective on livelihoods



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ABSTRACT

The water–energy–food nexus is being promoted as a conceptual tool for achieving sustainable development. Frameworks for implementing nexus thinking, however, have failed to explicitly or adequately incorporate sustainable livelihoods perspectives. This is counterintuitive given that livelihoods are key to achieving sustainable development. In this paper we present a critical review of nexus approaches and identify potential linkages with sustainable livelihoods theory and practice, to deepen our understanding of the interrelated dynamics between human populations and the natural environment. Building upon this review, we explore the concept of ‘environmental livelihood security’ – which encompasses a balance between natural resource supply and human demand on the environment to promote sustainability – and develop an integrated nexus-livelihoods framework for examining the environmental livelihood security of a system. The outcome is an integrated framework with the capacity to measure and monitor environmental livelihood security of whole systems by accounting for the water, energy and food requisites for livelihoods at multiple spatial scales and institutional levels. We anticipate this holistic approach will not only provide a significant contribution to achieving national and regional sustainable development targets, but will also be effective for promoting equity amongst individuals and communities in local and global development agendas.

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1. Introduction

Recently there has been renewed interest in the longstanding definitional ambiguities of the term ‘sustainable development’ and the development of frameworks for its effective application in local and global contexts. This debate has been reignited in anticipation of the post-2015 targets for sustainable development, as set out in the Sustainable Development Goals (SDGs), and the pending expiration of the timeframe for the targets of the Millennium Development Goals (MDGs)¹. The United Nations is pushing

forward a new set of goals and targets for the post-2015 agenda which aims to achieve the long-term sustainable development of human society as a whole². The SDGs commit subscribing countries to new action targets aimed at achieving sustainable water use, energy use and agricultural practices, as well as promoting more inclusive economic development (United Nations, 2014). The water–energy–food nexus has become central to discussions regarding the development and subsequent monitoring of the SDGs. However, while all of the proposed 17 SDGs also resonate with the concept of sustainable livelihoods, the term ‘livelihoods’ is not mentioned anywhere in current documentation

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¹ www.un.org/millenniumgoals

² An outcome of the Rio + 20 United Nations Conference on Sustainable Development resulted in the Future We Want report (United Nations, 2012).

(see [United Nations, 2014](#)). This is counterintuitive given that, as we argue more fully in this paper, livelihoods are key to achieving sustainable development.

This paper briefly summarises the historical and theoretical development of sustainable livelihoods and nexus approaches, identifying synergies between these two approaches which have resulted in what [Biggs et al. \(2014\)](#) have termed ‘Environmental Livelihood Security’ (ELS). Based on an extensive review of relevant literature and theoretical paradigms set out by [Biggs et al. \(2014\)](#), ELS was defined as a concept that seeks balance between natural resource supply and human demand on the environment in order to promote sustainability. Accordingly, a robust integrated nexus-livelihoods framework for examining the ELS of a system is necessary for practical application of the concept. In this paper we present such a framework and propose this as a solution for ensuring livelihoods are explicitly accounted for within the water–energy–food nexus. To ensure accurate monitoring of SDG progress and enable sub-national accounting for spatial disparities in meeting SDG targets – a characteristic that the MDGs have been critiqued as deficient in ([Black and White, 2004](#); [von Dach et al., 2006](#)) – we present a framework which is adaptable to a range of spatial scales and institutional levels. Finally, we seek to demonstrate how our framework has the potential for many practical cross-sectoral applications which, we argue, will make a constructive contribution to advance the agenda on sustainable development.

2. Sustainable livelihoods approaches

Broadly speaking, approaches to sustainable development have focused on ‘top-down’ quantitative indicators based on scientific expertise and have a tendency to measure progress at national, regional and global scales. Conversely, sustainable livelihood approaches have tended towards more ‘bottom-up’ qualitative analyses of data obtained at household, community and local levels. Sustainable livelihood approaches have evolved from shifts in perspectives on poverty, participation and sustainable development ([Sen, 1981](#); [Chambers and Conway, 1992](#)) and in 1987, the World Commission on Environment and Development used the term ‘sustainable livelihoods’ for the first time in discussions on resource ownership, basic needs, and rural livelihood security ([WCED, 1987](#); [Conroy and Litvinoff, 1988](#)). The 1992 UN Conference on Environment and Development positioned sustainable livelihoods as a means of linking socioeconomic and environmental concerns ([Brocklesby and Fisher, 2003](#)). Both instances were important for moving international concern regarding environmental problems towards a focus on people and their livelihood activities, and placing these concerns within a policy framework for sustainable development ([Biggs et al., 2014](#)). In the livelihoods context at the local level, the question of environmental sustainability is focused on whether livelihood activities maintain and enhance, or deplete and degrade, the natural resource base. Livelihood activities may contribute to desertification, deforestation, soil erosion, declining water tables and salinisation ([Chambers and Conway, 1992](#)); but conversely they may benefit environmental conservation through climate-compatible activities such as reforestation and agro-biodiversity ([Tompkins et al., 2013](#)). At the global level, the question is whether livelihood activities make a net positive or negative contribution to long-term environmental sustainability, and therefore to other livelihoods ([Chambers and Conway, 1992](#)).

The Sustainable Livelihoods Approach (SLA) provides a means of linking socioeconomic and environmental concerns ([Brocklesby and Fisher, 2003](#)). It can be used as an analytical tool for understanding the factors that influence a community’s ability to enhance livelihoods and eradicate poverty ([FAO, 2002](#)). Central to the

sustainable livelihoods paradigm is recognition that people draw upon a range of assets to realise their livelihood objectives ([DfID, 2001](#); [Biggs et al., 2014](#)). These assets are grouped into capitals – financial, natural, human, physical, political and social (refer to [Scoones, 1998](#); [Bebbington, 1999](#); [FAO, 2008](#)) – whereby capitals serve as inputs and/or outcomes for livelihoods, with the security of livelihood capitals vulnerable to external factors including environmental and market stresses ([Morse et al., 2009](#)). Various construed as a set of principles, an analytical framework and a development objective ([Farrington, 2001](#); [Morse et al., 2009](#)), the sustainable livelihoods approach has the flexibility and capacity to be combined with other paradigms such as the nexus approach discussed below.

Critiques of the SLA were largely summarised by [Scoones \(2009\)](#) who identified four recurrent failings within the approach: (i) an inability to deal with big shifts in the state of global markets and politics; (ii) a lack of focus in linking livelihoods and governance debates to development; (iii) a lack of rigour in accounting for long-term large-scale environmental change; and (iv) a failure to adequately relate agrarian changes with long-term shifts in rural economies ([Biggs et al., 2014](#); [Horsley et al., 2015](#)). Additionally, although the SLA recognises in theory that the vulnerability context of livelihood assets includes environmental conditions, applications of the SLA have not generally included sound scientific analysis of short- and long-term climatic and other environmental events affecting livelihood resilience, nor expressed recognition of the dynamics of the water–energy–food nexus and the impacts of these on each of the livelihood capitals. Although some research has addressed elements of these shortcomings³ current research only implicitly incorporates the fundamental components of achieving sustainable livelihoods from an environmental perspective. We argue that these weaknesses can be adequately compensated for by explicitly combining elements of the SLA framework with elements from the water–energy–food nexus framework to inform a more holistic model.

3. Water–energy–food nexus approaches

‘Nexus thinking’ was first conceived by the [World Economic Forum \(2011\)](#) to promote the inseparable links between the use of resources to provide basic and universal rights to food, water and energy security. Whilst the [World Economic Forum \(2011\)](#) presented the nexus framework from a securities perspective (water–energy–food security), subsequent versions have taken on various facets with alternative components, such as water resources as a central component ([Hoff, 2011](#)), land use–water–energy ([Howells et al., 2013](#)) and food as a core component with land–water–energy linkages ([Ringler et al., 2013](#)). Nexus thinking is advocated as an advance on current and often sector-specific governance of natural resource use.

Current nexus framings are often focused on macro-level drivers of resource consumption patterns (see [Table 1](#)). However, ‘larger scale’ extraction and consumption of natural resources may lead to depletion of natural capital stocks and increased climate risk without an equitable share of the benefits ([Hoff, 2011](#); [Rockström et al., 2009](#)). An example of this exists in north-west India, where intensive agriculture has been driven by government policies to support national food welfare. Unfortunately, these policies have degraded ecosystems without increasing levels of food security ([Aggarwal et al., 2004](#); [Pritchard et al., 2013](#)). With regard to the sustainable development goals, [Griggs et al. \(2013\)](#) argues for a more unified environmental and social framework

³ See for example [Turner et al. \(2003\)](#) who considered human–environment interactions where vulnerability is influenced by the asset base (converse to the SLA); or [Donohue and Biggs \(2015\)](#) who adopt of a multidimensional approach to monitoring livelihoods whereby natural capital is quantitatively assessed.

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