Ecological Economics 83 (2012) 11–18

Contents lists available at SciVerse ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Methodological and Ideological Options

Global governance for sustainable energy: The contribution of a global public goods approach ☆

Sylvia I. Karlsson-Vinkhuyzen [a,*], Nigel Jollands [b], Lawrence Staudt [c]

[a] Public Administration and Policy Group, Wageningen University, Hollandseweg 1, 6700 EW, Wageningen, The Netherlands
[b] European Bank for Reconstruction and Development, 1 Exchange Square, London, EC2A 2JN, United Kingdom
[c] Centre for Renewable Energy, Dundalk Institute of Technology, Dundalk, County Louth, Ireland

ARTICLE INFO

Article history:
Received 11 March 2011
Received in revised form 21 August 2012
Accepted 25 August 2012
Available online xxxx

Keywords:
Global energy governance
Global public goods
Subsidiarity
Renewable energy
Energy efficiency

ABSTRACT

Achieving a sustainable energy future requires a revolution in the energy system. At the heart of such a transformation lies strong and coherent governance at all political levels, including the global level. While the need for global governance is taken for granted in a number of issue areas such as health, peacekeeping and environment, pursuit of global energy governance has been almost a taboo in political and foreign policy circles and has also had limited attention in the literature. In this paper, we explore how the viewing of a sustainable energy system as a global public good could serve as one approach to reducing the sensitivity towards global energy governance. The global public good concept together with the principle of subsidiarity is applied as a framework for understanding the role that the international community could play in, and the key ingredients for, global energy governance. Using two examples of international energy efficiency and renewable energy policy, we identify some types of international collaboration measures that would be both efficient and necessary to support a sustainable energy system.

1. Introduction

As we embark into the 21st Century, there is little doubt that humanity faces daunting energy-related challenges. Access to energy sources is becoming more expensive, there is an urgent need to de-carbonize our energy future and billions of people do not have access to even basic energy services. There is now increasing acknowledgment of the need for a transition to sustainable energy production and consumption patterns — "[w]hat is needed is nothing short of an energy revolution" (International Energy Agency, 2008).

In such a context, we need to draw on all the tools at our disposal: new technical solutions, policies, efficient markets, and perhaps more challenging, changes in consumption patterns. This will require strong and coherent governance at all political levels, including the global level. However, while the need for global governance is taken for granted in a number of issue areas such as health, peacekeeping and environment, pursuit of global energy governance has been almost a taboo in political and foreign policy circles and has also had limited attention in the literature. In recent years nonetheless, several commentators have raised the need for stronger global energy governance, e.g. in the form of a World Energy Organization (ElBaradei, 2008), global norms for sustainable energy (Bradbrook and Wahnschafft, 2005) and reduced oil dependency (Heinberg, 2006), or more international collaboration (Goldthau and Witte, 2010a; Gururaja, 2003; Lesage et al., 2010; Steiner et al., 2006; UN-Energy, 2010). The motivations they use for strengthening global energy governance are, nevertheless, relatively vague referring to the scope of the global energy challenges. Also these commentators avoid addressing critical issues such as a specific definition of global energy governance or theoretical framings of why it is needed and what forms it could take. This is a gap we seek to address in this paper.

Ecological economics (EE) has been referred to as the 'science and management of sustainability' (Constanza, 1991). Such an engagement with sustainability can only be achieved if governance issues are an integral part of an ecological economics approach, see for example Paavola (2007) and Slavíková et al. (2010). In this paper we draw on an ecological economics perspective and define governance in a broad socio-economic system that aspires towards common interests, within a specific community, local, national or global. Global energy governance then encompasses those efforts which seek to manage energy as a common affair in the international community (Karlsson-Vinkhuyzen, 2010).[1] Energy has for almost a century been considered an issue of national security — particularly since oil became a strategic asset for both the military and for socio-economic development, and thus not an area of common

☆ Disclaimer: The views expressed in this paper are made in the authors' personal capacity and do not reflect the views of their institutions.

* Corresponding author. Tel.: +31 317 4 82133.
E-mail addresses: sylvia.karlsson-vinkhuyzen@wur.nl (S.I. Karlsson-Vinkhuyzen), jollandN@ebrd.com (N. Jollands), LDStaudt@gmail.com (L. Staudt).

[1] This definition of global energy governance excludes, for example, collaboration among energy companies for the sole purpose of increasing profits or other measures aimed to promote only the interests of one or a few stakeholder groups.

0921-8009/$ – see front matter © 2012 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.ecolecon.2012.08.009

concern for humanity. Energy governance has primarily been national, and in some cases local or regional and governments have, with a few exceptions, been very reluctant to develop international norms and institutionalize cooperation around energy, particularly within the universal context of the United Nations (Karlsson-Vinkhuyzen, 2010). Scholars who have looked at global energy governance have either used arguments in favor of a functioning global energy market (Goldthau and Witte, 2010a) or given no detailed criteria for why it needs global governance beyond it being linked to issues such as climate change and poverty and thus a 'mega issue' of 'global scope' (Lesage et al., 2010). We argue that this does not provide a sufficiently coherent and persuasive framework for stronger global energy governance.

In this paper we argue that a key factor to reduce this sensitivity to global energy governance is to switch the mind-set of scholars and governments towards viewing aspects of energy as a common global concern by developing a theory and understanding of a sustainable energy system as a global public good (GPG) and looking at its provision from the perspective of the principle of subsidiarity. This is an attempt to encourage debate and "propel social change toward sustainable development" (Hezri and Dovers, 2006: 87) perhaps more forcefully than what can be achieved with analyses based on national mind-sets. At the same time a GPG approach, as will be discussed below, could enable states with all types of energy situations (producers, consumers, exporters etc.) to see that they all have something to benefit from investing in such a sustainable energy system as joint benefits is the nature of public goods. Applying the concept of GPG is not new to EE audiences (Farley et al., 2010; Kemkes et al., 2010), but a sustainable energy system has not previously been systematically analyzed within this framework.

2. Global Public Goods in Theory and Discourse

The classical definition of a pure public good is for some good or service where there can be no exclusion of those who refuse to pay for the good or service to enjoy the benefits (non-exclusive) and no rivalry among the beneficiaries of the good or service (non-rivalry). In other words "if a public good exists … anyone can use it regardless of who pays for it" (Daly and Farley, 2004:169).

These concepts deserve attention as they underpin the notion of GPGs. A good or service is excludable if its "ownership allows the owner to use it while simultaneously denying others the privilege" (Daly and Farley, 2004:73). It is worth noting that nothing is inherently excludable — policies or social institutions are required to make any good or service excludable. On the other hand, some goods or services are inherently non-excludable as a physical characteristic. Examples of such non-excludable goods or services include climate regulation or the air we breathe. In the absence of an institution or technology being able to enforce exclusion, it is known as a non-excludable good or service.

In contrast, a good or service is 'rival in consumption' when one person's use reduces the amount available for everyone else. A non-rival good or service is where its use by one person does not impact on another's use. For example, my use of London's flood barrier service to protect my home does not decrease the amount of flood protection for my neighbors. It is important to note that "rivalness is a physical characteristic of a good or service and is not affected by human institutions" (Daly and Farley, 2004, p73). Importantly, non-rivalry shouldn't be confused with abundance. For example, seats at a conference are rival, in that if one person occupies a seat, another cannot at the same time. However, unless all seats are filled, there is no competition for use, and they can be regarded as abundant. We can ration access to a resource to keep the resource abundant, but it is always rival. The concepts of excludability and rivalry can be used to help our understanding of GPGs. Fig. 1 shows how two examples of GPGs can be placed within the two dimensions of excludability and rivalness. For example, the benefits flowing from the sustainability of a global energy system (see Section 3) (such as reduced rate of depletion of natural capital or reduced impact on the climate system) could be considered a GPG because:

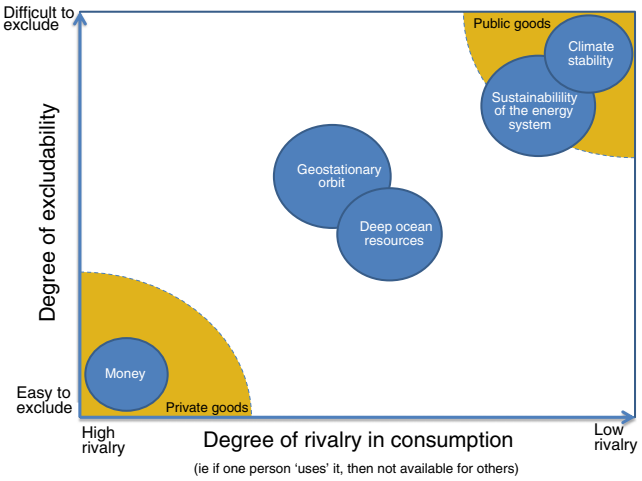

Fig. 1. Schematic illustration of the nature of public goods.

a) it would be difficult to *exclude* anyone from those benefits
b) my enjoyment of such benefits does not reduce another's ability to take advantage of those benefits.

The theories around public goods have been centered in the context of national governance and the 'global' word has only gained attention in the last couple of decades. The global attribute lifts the perspective to goods which yield benefits for all countries, people and generations and "can be seen as a dimension of publicness" (Kaul et al., 2003b:10).

Global public goods are usually underprovided. Nonetheless, the international community has been able to provide some GPGs at sufficient levels, such as postal infrastructure, internet etc. For many other GPGs, under provision is severe. For example, according to Farley et al. (2010; p 2075) "[l]ocal efforts to provide ecosystem services are unlikely to consider global benefits, and global beneficiaries are prone to free-ride on local efforts. The likely result is an under provision of global ecosystem services". Barrett (2007) has provided a helpful categorization of GPGs linked to the provision needs, showing that policy considerations cannot be generalized and rather need to be adjusted for each specific GPG.

In the last decade analytical work in the GPG framework has often been initiated or supported by states such as Sweden (Sagasti and Bezanson, 2001) and international organizations including the United Nations Development Program (UNDP) (Kaul and Conceição, 2006; Kaul et al., 2003a). The UNDP has in this respect acted as a norm entrepreneur actively promoting the concept of GPGs in the political discussions on global governance. The first reaction to this work was primarily positive but over time it has met with resistance from a few academics,[2] some industrialized countries such as the United States and Japan and many developing countries. Indeed, active efforts by proponents such as the EU to incorporate the concept in outcome documents of major intergovernmental conferences in the early 2000s largely failed due to this resistance (Carbone, 2007). In a more recent development the science advisory council of the Dutch Government advised the use of a GPG approach to reframe development assistance into an agenda for international cooperation (van Lieshout et al., 2010).

[2] Long and Woolley (2009), for example, argue that the concept is not a good analytical tool because the way it has become defined means a very high degree of abstraction and thus avoids "complexity and real-world issues" (Long and Woolley, 2009:111).

3. The Sustainability of the Global Energy System as a GPG

The energy system itself has been largely absent in the literature on GPGs.[3] Kaul and Le Goulven (2003) only consider sustainable elements of the energy system as national and regional public goods which support global climate stability which in itself is the perfect example of a pure GPG (Farley et al., 2010). We argue that there are good reasons, both normative and analytical, to view the *sustainability* of the global energy system as a GPG (Karlsson-Vinkhuyzen et al., 2009). This proposition may seem counter-intuitive considering that energy is a commodity that is thought of as both rival and excludable. For the individual consumer this is certainly the case. A *sustainable* energy system is a clear GPG if, and only if, one takes a systems perspective.

Before proceeding, it is useful to define what we mean by an energy system in this paper. A systems perspective of sustainability often considers three domains; environmental, social and economic. We adopt such a systems perspective to define an energy system broadly to include:

- the physical infrastructure needed to extract, transport, transform and use energy;
- the physical impacts on the environment and people of energy extraction, transport, transformation and use;
- the social institutions (such as international agencies, governments and the regulatory frameworks, markets and civil society groups) designed to support the flow of energy services; and
- the individual actors involved in using energy services.

An energy system that has low or no carbon intensity would be a public good for all humanity because it would give the non-excludable and non-rival benefit of a less dangerous degree of climate change. There are similar public good properties also of sustainable local energy systems; for example, local air pollution resulting from the burning of coal or oil produces a public bad and an energy system which regulates and promotes less polluting sources would thus provide non-excludable and non-rival benefits for the community.

However, there are a number of other public good dimensions of a sustainable energy system, beyond its link to pollution and climate change. An energy system which encourages energy efficiency and relies less on carbon and more on renewable energy sources can mean that more people will have access to modern energy services in the future. Fossil fuels are definitely rival in character. Podobnik (2002:253) concludes that because such a dominant portion of the world's energy consumption is based on non-renewable resources (coal, petroleum, natural gas) the energy foundation for the world economy is a zero-sum game, where consumption of these resources by one group "implies a future inability to consume for other groups". Policies that promote and support renewable energy on the other hand provide a largely non-rival and non-excludable benefit for future generations.[4] Access to modern energy services is both excludable and rival but it is a pre-requisite for economic and social development.[5] More equal global prosperity, and thus drastically reduced poverty levels, are by itself normative goals even if it is not a GPG. It is the poorer countries that will often have most to gain in the long run from a sustainable energy system because they would be less dependent on expensive fossil fuel imports (and they also tend to have most to gain from avoiding dangerous levels of climate change).[6] Nonetheless, many rich countries, or indeed the security of the world community, would likely benefit from reducing competition for scarcer petroleum resources and reliance on a few big producers of their energy needs. A world less dependent on fossil-fuels may also be one with less cause for geopolitical tension and conflict around the remaining reserves and thus contribute to peace, see for example Podobnik (2002).

We thus argue that the sustainability of the energy system is a GPG. This is a direct equivalent to looking at the stability of the financial system as a GPG (Griffith-Jones, 2003).[7] Once financial stability has been achieved it is nonrivalrous and nonexcludable and thus a GPG (Griffith-Jones, 2003). It is a societal choice to view the global energy system as a system and thus identify its sustainability as a GPG. Long and Woolley (2009) in their critique of the GPG concept, argue that when it is applied to phenomena such as the financial system, global peace or environmental sustainability, these are systemic factors and thus by definition constitute public goods. They, rightly, argue that "[b]y virtue of being a system-level factor or characteristic, that factor must be nonrival and nonexcludable within that system… this is a question of self-definition, not analysis" (Long and Woolley, 2009:112). We cannot see why this very clear and logical reason for seeing systemic factors as GPGs would be an argument against the concept. On the contrary, the increasing interconnectedness of the world makes this perspective a necessity.

4. How Much Global Provision of Global Public Goods?

Irrespective of how much, or little, countries are currently willing to contribute to a sustainable energy system, our question is: How much of the provision of such a GPG should take place at the global level; that is, through global governance?[8] In addressing this question we turn to arguments for how to allocate governance to different levels including the supranational without relying on national sovereignty as a primary criterion as the latter is one major obstacle in current efforts towards strengthening global energy governance. The literature dedicated to the concept and application of the principle of subsidiarity falls in this category and provides our starting point. Subsidiarity is about the allocation of authority, power and tasks in a political order and about determining at what level of government – or governance – these should reside (Føllesdal, 1998). The concept is based on the assumption, similar to what was argued above for the provision of GPGs, that "no single level of organization is appropriate for all social functions" (Trachtman, 1992:468) and has been subject to considerable analysis in the study and practice of governance in the European Union (EU). The EU is of course a very special case of governance but it is the only one where politicians and scholars have so systematically discussed the allocation of governance to levels above the nation-state.

The principle of subsidiarity has been institutionalized in the EU's Maastricht Treaty both as a substantive principle prescribing that decision-making should be made as close as possible to the citizens (Scott et al., 1994), and as a procedural principle, prescribing that the European Community shall only take action if Member States cannot achieve the intended objectives and these 'can, therefore, by reason

[3] Lesage et al. (2010:159) claim that the G8 "attempts to provide unilateral leadership for sustainable energy future as a global public good" and elsewhere mention the notion of international public goods in relation to energy but does not go further into defining or discussing the concept. Goldthau (2010) argues for viewing global energy security as a GPG, focusing on the global benefit of stable international markets in fossil fuels.

[4] Renewable energy sources are often virtually non-rival over space and time, such as sunlight and to a certain extent wind, wave and geothermal energy. There is a dimension of rivalry, for example for the most attractive sites to build a wind turbine, hydropower or geothermal plant. However, the full utilization of the renewable energy in one location would generally not diminish the availability of that energy source in other locations. Other renewable energy sources such as biomass are rival as there is competition for land. But if the production system is sustainable and does not degenerate the soil over time it is non-rival towards future generations.

[5] Access to energy has been recognized as an essential means to achieve the Millennium Development Goals, facilitate education and healthcare, enable small businesses to develop, and an important tool to reduce the burden of women.

[6] A parallel argument has been made by Griffith-Jones (2003), regarding the GPG of a stable financial system: poor countries and poor people suffer significantly during financial instability and thus have much to benefit from this GPG.

[7] Griffith-Jones (2003) sees both the stability of the market system as well as its efficiency as a GPG.

[8] A sustainable energy system clearly belongs to the aggregate effort GPG in Barrett's (2007) classification.

of the scale or effects of the proposed action, be better achieved by the Community'.[9] The two aspects of subsidiarity, the substantive and procedural, can be linked to the legitimacy and effectiveness dimension of the concept respectively. The substantive principle aims to close the democratic deficit and the procedural principle is to ensure that effectiveness rules rather than the principle of sovereignty.

Føllesdal (1998) interprets the procedural principle so that action should be taken at the level where it is most effective, the effectiveness condition; and that action at the higher level should be taken when lower levels cannot achieve the set goals in isolation, the necessity condition. The latter may occur either because lower levels do not have the capacity or because they are not willing to take action due to different priorities.

A direct parallel argument to the effectiveness and necessity conditions for supranational governance in the EU can be made for when the global level needs to become more involved in providing GPGs; when it is more *effective* or *necessary* to do so. In the next sections, we will explore when this may be the case for global collaboration for a sustainable energy system.

5. Global Provisioning of a Sustainable Energy System

While the academic attention to global energy governance has been scant, it has picked up in the last few years with analysis that identifies key actors, activities and institutions (Florini and Sovacool, 2009; Goldthau and Witte, 2010a; Karlsson-Vinkhuyzen, 2010; Lesage et al., 2010). Most of these analyses however, do not distinguish clearly in their analysis between global governance that supports or thwarts a *sustainable* energy system, nor do they specify principle based criteria for what type of governance is needed at the global level.

Here we apply the subsidiarity principle for identifying when global governance is of value; when it is effective and necessary. Global collaboration in providing the GPG of a sustainable energy system will be *effective*:

1) when addressing GPG dimensions to policies themselves which are unlikely to be addressed by individual countries or the market such as knowledge and norms promoting sustainable energy
2) when it aims to strengthen the coherence of the international community's governance for sustainable energy coordinating ad hoc efforts and avoid overlaps

Global provision is *necessary*:

1) when lower levels of governance do not have the capacity or will to take action to promote sustainable energy, or;
2) when global institutions (both norms and organizations) are contributing to preserving a fossil-fuel based unsustainable energy system

In the following section we will explore in more detail how the current state of global energy governance fares against these criteria. We do this first in more general terms and then for two core elements of a sustainable energy system that have received considerable international policy coordination attention recently: energy efficiency and renewable energy. For each section we will outline the benefits they provide for the sustainability of the energy system, barriers to further action, options for global governance, a list of current (limited) attempts at global governance and suggestions where these initiatives could be strengthened.

5.1. Global Institutions for Sustainable Energy

The effectiveness criteria for global energy governance would prescribe e.g. international norms and coherence of the international community's activities on energy. On norms, the 20th century was characterized by a veritable explosion of international norms, both in the legally binding form of treaties etc. (hard law) and in the non-legally binding form of declarations etc. (soft law), however, energy and sustainable energy largely escaped this thickening of the normative landscape particularly in the UN context (Karlsson-Vinkhuyzen, 2010). But also in the field of trade there are no commonly agreed rules for the trade of energy resources and investment flows (Goldthau and Witte, 2010b).[10] In the last two decades of the 20th century and the first decade of the 21st this changed marginally. Sustainable energy, or rather energy for sustainable development, emerged as a theme in environment oriented summits, sparingly in Agenda 21 adopted at the Earth Summit in Rio de Janeiro in 1992, but more in the Johannesburg Plan of Implementation (JPOI) from the World Summit on Sustainable Development (WSSD) in 2002. The JPOI primarily confirmed the Decision on energy for sustainable development adopted at the 9th Commission on Sustainable Development (CSD) held in 2001 which makes very general recommendations on energy efficiency, renewable energy, rural energy, transport etc. (Commission on Sustainable Development, 2001). The CSD-9 was the first time this theme had been discussed in a high-level intergovernmental setting and the CSD returned to the same topic in its 2006/2007 meetings. This time however, disagreements were so substantial that no decision was adopted (Karlsson-Vinkhuyzen, 2010). This makes a rather meager collection of normative text adopted by the international community and what has been adopted is vague and lacking accompanying implementation plans with division of responsibilities. Nonetheless, 2012 has been designated as the International 'Year of Sustainable Energy for All' by the UN and considerable but fruitless efforts were made for the United Nations Conference on Sustainable Development in Rio de Janeiro in 2012 to adopt targets related to energy efficiency, renewable energy and energy access.[11] The climate regime is another possible source of norms for a sustainable global energy system if it becomes strong enough to influence member states to both reorient their national energy systems and support international organizations to do the same (Karlsson-Vinkhuyzen, 2010).

On coherence, collaboration among governments at the global level in support of sustainable energy has been intensifying both within and outside the UN system albeit from low starting levels. Almost all UN organizations, agencies and programs have some activities related to energy in developing countries, thus implicitly fulfilling the necessity criterion for global governance where there is not enough capacity at levels. Most of these activities, at least in financial terms, have, however, gone to carbon intensive rather than renewable energy sources, thus creating a situation where it would indeed be necessary to counteract this with global governance for sustainable energy. Each organization addresses energy from its own priorities, whether it is poverty eradication, environment or industrial development and the degree of coordination within the UN system is low (Karlsson-Vinkhuyzen, 2010). Outside the UN system there are many recent efforts by the International Energy Agency (IEA), G8, and various regional intergovernmental organizations to both discuss and more concretely collaborate on certain elements of sustainable energy measures, see e.g. Karlsson (2009) and Lesage et al. (2010), and in 2009 a new intergovernmental organization was established on renewable energy (see below). There are also many multistakeholder or public–private partnerships targeting a particular sub-set of the energy sector, some of which we will describe below.

[9] Article 3b (2), Treaty of the European Community.

[10] There are no specific rules for energy trade in the WTO but it is now becoming accepted that WTO rules apply to energy in the same way as to other projects. The challenge is, however, to adapt the WTO framework to the international norms on climate change (Selivanova, 2010).

[11] The goals of universal energy access by 2030, energy intensity reduction of 40% and a global energy mix of 30% renewables were adopted at the Vienna Energy Forum in 2011 and a campaign was launched to raise awareness of these for the Rio+20 meeting (IISD, 2011b).

5.2. Emerging Global Policy Coordination on Energy Efficiency

A system promoting energy efficiency has many advantages and is a key component of a sustainable global energy system. First, such a system can result in greatly reduced greenhouse gas emissions. The IEA (2009) estimates that 59% of mitigation strategy investments to achieve the 450 ppm scenario by 2030 must come from end-use efficiency. It has been estimated that if all cost-effective energy efficiency measures were implemented it could reduce energy consumption growth between 55 and 75% by 2030 compared to business as usual (McKinsey quoted in AGECC (2010)). Energy efficiency is also often the cheapest source for additional energy as e.g. developing countries struggle to fill increasing demands.[12]

Achieving energy efficiency improvements, however, is not straightforward. Energy efficiency is 'invisible', difficult to quantify and the subject of several pervasive barriers including the low priority many consumers and businesses place on reducing energy costs through energy efficiency improvements, access to capital and market failures including principal–agent problems, insufficient information, and externalities, see for example International Energy Agency (2007). Some of these barriers lie in the international domain, for example the lack of international standards provides a barrier to trade in energy efficient goods.[13]

The local and global benefits of achieving low energy intensity (high energy efficiency) should mean it is a win–win situation for all states to cooperate to achieve it. Energy-efficiency can be pursued in many locations without concern that it will reduce the opportunity for such measures elsewhere, except if there is a competition for investment. *Global* cooperation would be in line with our framework be particularly valuable if it supported the capacity and motivation of countries to take action, addressed barriers in the international system and targeted the social/political system properties of energy efficiency as a GPG. In particular, the development of international standards and the removal of distortionary fossil fuel subsidies can play an important role in the contribution to the sustainability of the global energy system according to the effectiveness and necessity criteria of the principle of subsidiarity. Fig. 2 captures some of the elements of energy efficiency (many of which have direct parallels for renewable energy discussed below) that are more private vs. public in the two dimensional space of rivalry and excludability. Some elements of energy efficiency are more easily made public (such as information on best policy options and technologies and international standards) than others (such as the energy savings benefits from the installation of new energy efficient technology).

International standards (IS) of product energy performance exhibit particularly strong public good characteristics and would also address a current obstacle for energy efficiency promotion in the international system. While many countries employing national standards and some regional standards are emerging, it is not enough, particularly in the case of globally traded goods (International Energy Agency, 2010b). National standards have proved to be highly effective in achieving energy savings at low cost (Waide and Bernasconi-Osterwalder, 2008), but IS have three additional benefits: they help to avoid duplication of effort, support scientific cooperation and possible harmonization of public policies, and allow for interoperability of goods across national boundaries. International standards could be adopted in a way that is flexible in relation to different climate conditions and product usages by taking efforts to "minimize unnecessary differences in energy performance test procedures, certification, accreditation and compliance regimes" as this would "simplify the number of different tasks a manufacturer has

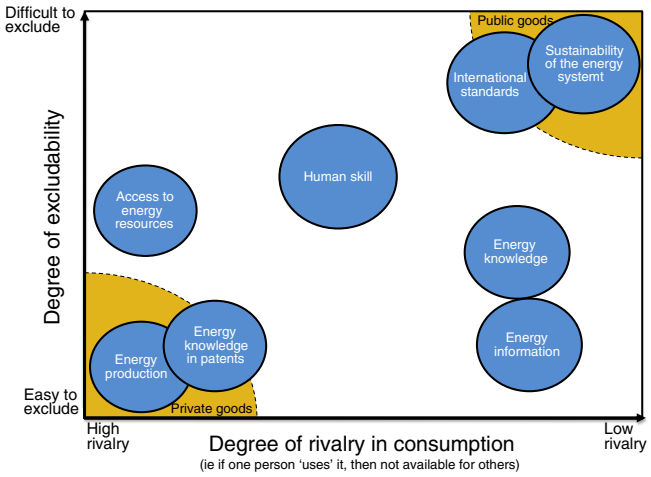

Fig. 2. Schematic illustration the public vs. private nature of elements of the energy system.

to undertake in order to sell products into multiple international markets" (Waide and Bernasconi-Osterwalder, 2008:4). Companies would then have larger incentives to invest in R&D for more efficient technologies (AGECC, 2010).

Other international norms such as a treaty that bans the export of old energy inefficient technology to developing countries, see Bradbrook and Wahnschafft (2005) and an international pledge (IISD, 2011a) to remove fossil fuel subsidies could contribute to a more sustainable energy system. The international community could also set itself targets for energy efficiency, for example, the UN Secretary General's a Advisory Group on Energy and Climate Change (AEGCC) suggested a target for reducing global energy intensity by 40% by 2030 (AGECC, 2010).

Many countries have recognized that energy efficiency could be a fruitful area for international cooperation. For example, the International standards organization (ISO) and International Electro-Technical Commission (IEC) have been active for decades setting standards that directly influence energy efficiency policy. The ISO has around 20 technical committees concerned with energy efficiency and has published more than 100 ISO standards covering energy efficiency of buildings, industrial products and processes, fuel consumption of vehicles, methods for analysis and energy management.[14] At the policy level the IEA's Energy Efficiency Working Party has been meeting for almost three decades. This forum provides senior government officials of IEA member countries (and recently also from China, India and Russia) an opportunity to share information and experience relating to energy efficiency policy development and implementation. More recently, there has been an increased attention focusing on global energy efficiency cooperation spearheaded by the G8 Gleneagles Plan of Action (G8, 2005)[15] and later followed by the G8 initiated International Partnership for Energy Efficiency Cooperation (IPEEC) by the G8 members plus Australia, Brazil, China, India, Mexico, the Republic of Korea and the European Community. The partnership's focus is to facilitate those actions that yield high energy efficiency gains and improvements.[16] The IPEEC will encourage cooperation in areas including exchanging information on standards/codes/norms and labels for buildings, energy-using products and services, methods for energy measurement, tools for financing energy efficiency, public procurement policies, best practice guidelines, technology development etc.

However, these and other on-going efforts by various international organizations are not sufficient. Despite the obvious advantages there

[12] There is a discussion on the potential double effects of strong action on energy efficiency; this can help all countries by reducing demand for fossil fuels and thus reducing their price, which at the same time creates negative incentives for further efficiency measures and emission reductions.

[13] This is illustrated by the fact that the single largest causes of national notifications to the WTO under the Agreement on Technical Barriers to Trade are efficiency standards and labels (Waide and Bernasconi-Osterwalder, 2008).

[14] This information was obtained from a presentation by Rob Steele, ISO Secretary-General, to IEA-ISO IEC Workshop 'International Standards to promote energy efficiency and reduce carbon emissions', Paris, 16 March 2009.

[15] See http://www.number10.gov.uk/Page7882 accessed 15 April 2009.

[16] See http://www.energy.gov/media/IPEEC_declarationfinal_June082008.pdf accessed 1 March 2009.

is still some resistance to collaborating on energy efficiency. This was clearly illustrated in the CSD negotiations in 2007 where the most contentious issue in the paragraph on energy efficiency was the one on international-level measures (Karlsson-Vinkhuyzen, 2010). Most of the text remained bracketed when negotiations stopped. In the paragraph on efficiency standards and labeling the regional or international cooperation that many governments had called for in their statements was reduced to "international support for national efforts to adopt standards and labeling for energy-efficient appliances and consumer equipment" (2007:17j).[17] This shows that it will not be easy to identify the 'who' and 'what' of stronger global provisioning of a more efficient energy system.

As a result of difficulties at the political level, efforts at the global coordination of such standards have intensified at a technical level. For example, the IEA's Implementing Agreement 'Efficient Electrical End-Use Equipment (4E)'[18] represents an initiative of 13 countries to coordinate their energy efficiency standards development and implementation. This type of technical-level activity could provide the model for a bottom-up, organic approach to the provision of GPG aspects of energy efficiency to complement the often tortuous political-level initiatives.

5.3. Emerging Global Policy Coordination on Renewable Energy

Renewable energy provides about 18% of the world's energy. Increasing the proportion of renewable energy in the national and global energy mix provides a key component of a sustainable energy system. Firstly, it is one of the major avenues to reduce CO_2 emissions. The International Energy Agency (2010a) estimates that around 150 GW/year of renewable energy generation capacity will need to be installed from now until 2050 in order to halve CO_2 emissions by 2050 which would mean that 50% of energy generation would come from renewables.

Secondly, it can increase energy security as renewable energy sources are much more geographically spread and all countries (in contrast to fossil fuels) have access to some sources that can be developed. Supply is also not exhaustive over time (if properly managed). Thirdly, renewable energy – because of the much more decentralized production pattern – can be a good option to provide people in distant rural areas who are not yet connected to the grid with modern energy.

Renewable energy uptake is very uneven, and poor countries are effectively excluded from the opportunity that renewable energy provides due the initial cost of technology development and implementation. Barriers and opportunities beyond high cost include: low public awareness, subsidies for conventional energy sources, ineffective political frameworks, inadequate value given to environmental damage (e.g. carbon emissions), inadequate technical know-how, and misinformation. Furthermore, key stakeholders tend to give low priority to technologies they are not familiar with (Karakosta et al., 2010), and established energy industries have fully developed technology, strong market structures, powerful companies and considerable financial subsidies. Authoritative information is lacking with regard to efficient policies in terms of legislation, market incentives and institutional frameworks. In the case of biofuels ambiguous analysis of the greenhouse gas emissions of the crops, the lack of harmonized sustainability standards and large scale subsidies and import tariffs in developed countries reduce the ability for expansion of trade from developing countries (Zarrilli, 2010). Obstacles in the international system include the highly volatile oil markets partly due to lack of international rules governing transparency etc., lack of regulation limiting fossil fuel subsidies and the unstable and low carbon price. These constitute obstacles for markets to make accessible the long-term capital required for alternative energy development and deployment (Huntington and Jojarth, 2010).

In order to contribute their part to a sustainable global energy system, developing countries could bypass the need for massive investments in "old" energy technology and move right into large-scale use of sustainable energy. The necessity criteria make this a clear case for global governance with massive supportive measures in order to transfer the necessary knowledge and resources to countries not able to benefit from these technologies and to motivate all countries to make significant investments in renewable energy. For example, investment from the market will not come to the least developed countries unless their domestic barriers are addressed and this can be done with support from bilateral and multilateral support (Cosbey et al., 2008). The governance of the global economy – including primarily international trade, investment, environmental treaties – needs to be designed so that it provides "a protective, encouraging and facilitating effect" on renewable energy (Steiner et al., 2006:156). High-capital intensive technologies such as some renewables may more than other options need long term certainty in the climate regime (Blyth, 2010).

The international community could also address the public good properties of the renewable energy system in a collaborative manner, benefitting from scale efficiencies and pooling of resources and expertise in line with the effectiveness criteria of the subsidiarity principle. For example, the level of research into renewable energy technologies is very low even in developed countries (in IEA member countries only 7.7% of RD&D is devoted to renewable energy), which should motivate pooling of resources. The report of the 2009 International Energy Conference identified several necessary functions of global energy governance including: internationally and nationally coordinated energy research agendas; a mechanism for influencing governments to prioritize energy research, and a mechanism for monitoring R&D developments worldwide, reassessing priorities and enabling rapid dissemination of research outcomes (UNIDO, 2009). Policy reviews and dissemination of best national practices by international organizations could benefit both developed and developing countries which could be complemented by policy assistance to developing countries (Lesage et al., 2010). Internationally accepted standards for the production process of biofuels would reduce barriers to trade for developing countries but in line with WTO case law such standards should be flexible and reachable through different approaches. Furthermore it is vital that developing countries are assisted so that they can participate in the development of such standards on equal terms (Waide and Bernasconi-Osterwalder, 2008).

The current global landscape of actors supporting renewable energy policy is characterized by compartmentalization, limited systematic pooling of information, analysis and coordination at an international level (Steiner et al., 2006), thus far from the coherence and cooperation that the effectiveness principle calls for. It involves UN agencies, international development banks, more limited intergovernmental arenas such as the G8 and organizations including the IEA, public–private partnerships, multi-stakeholder networks, industry associations and NGOs. Activities have covered the range from capacity building and project support in specific locations to biannual international conferences on renewable energy drawing together considerable governmental delegations and other stakeholders with voluntary public commitments as outcomes.[19] In the area of biofuels, there are many parallel but not coordinated efforts that exist to develop sustainability criteria for biofuels. A recent addition to the organizational landscape is the International Renewable Energy Agency (IRENA) that was established in January 2009 as a coalition of interested countries and outside the UN. With more than 149 countries, IRENA aspires to become the main driving force for promoting a rapid transition to widespread renewable energy use.[20] It envisages giving practical advice and support for all nations, facilitating access to all necessary information such as resource potential, best practice, effective financial and policy mechanisms, and technological expertise.

[17] In the end as noted above, there was no agreement on the decision document.
[18] See http://www.iea-4e.org/.
[19] These were started by Germany which organized one in Bonn 2004 and continuing in Beijing 2006, Washington D.C. 2008 and Delhi 2010, see www.ren21.net.
[20] See www.irena.org.

Renewable energy is more controversial in global governance than energy efficiency as it is a competitor to fossil fuels that many countries have substantial interests in. Periods of high oil prices and the prerogative of climate change have nonetheless triggered political interest in international cooperation. The WSSD in 2002 for the first time after tough negotiations included a semi-quantitative goal to 'substantially increase the global share of renewable energy sources… and regularly evaluate available data to review progress to this end' (United Nations, 2002). Many countries spoke warmly in favor of renewables in the negotiations on energy at the CSD in 2007, particularly the EU, least developed countries and small island developing states. Yet, in every paragraph referring to energy sources and technologies throughout the text there was a battle over the balance between fossil fuels and renewables (Karlsson-Vinkhuyzen, 2010). The EU tried to institutionalize a review process for the WSSD target on renewable energy that would involve a number of UN agencies but this met hard resistance and the negotiations broke down.

6. Conclusions

Each GPG has a unique provision path (Kaul and Le Goulven, 2003), and this will certainly be the case for energy should the international community start seeing and addressing the sustainability of the energy system as a GPG. Even then the national level will remain the key policy making level for creating a sustainable energy system globally, it is here that the main drivers of unsustainable energy production and consumption patterns lie and where most positive incentives for energy efficiency and renewable energy can be put in place. In this paper, however, we have focused on the role that the international community does and could play and explored ingredients for global energy governance through theories of GPG provision and subsidiarity in multilevel governance. This approach has enabled us to argue that global provisioning towards this GPG of a sustainable energy system is desirable when it is effective and necessary, such as in strengthening the capacity and motivation of countries to take action, addressing barriers in the international system and target the GPG properties of global sustainable energy collaboration including knowledge creation and diffusion, international standards and targets. We consider this approach to be fruitful as it gives more specific guidance on directions for strengthening global energy governance compared to approaches than previous efforts to analyze the need for global energy governance.

Kaul et al. (2003a) give considerable attention to the 'who' and 'how' dimensions of producing GPGs and they particularly stress the need for an open and participatory debate on which GPGs need to be produced jointly. We hope this paper will contribute to such a debate for a sustainable energy system. As the history of the development and political use of the GPG concept has shown, it still meets considerable resistance in general and is likely to meet even stronger resistance for energy. It will be a long road to make this issue as comfortable issue in global governance as global epidemics, environmental pollution or financial stability.

Acknowledgments

All three authors are members of the International Environment Forum and are grateful for the forum it provided to initiate the discussions that led to this paper. We also are grateful to the reviewers of Ecological Economics for the very constructive and helpful comments for strengthening the paper.

References

2007. 11 may 4:00 am. A. Energy for sustainable development. Commission on Sustainable Development, New York.
AGECC, 2010. Energy for a sustainable future. The Secretary-General's Advisory Group on Energy and Climate Change (AGECC). Summary Report and Recommendations. United Nations, New York. Online 1 February 2011, http://www.un.org/wcm/webdav/site/climatechange/shared/Documents/AGECC%20summary%20report%5B1%5D.pdf.
Barrett, S., 2007. Why Cooperate? The Incentive to Supply Global Public Goods. Oxford University Press, Oxford.
Blyth, W., 2010. How do emerging carbon markets influence energy sector investments? In: Goldthau, A., Witte, J.M. (Eds.), Global Energy Governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin, pp. 133–159.
Bradbrook, A.J., Wahnschafft, R.D., 2005. International law and global sustainable energy production and consumption. In: Bradbrook, A.J., Lyster, R., Ottinger, R.L., Xi, W. (Eds.), The Law of Energy for Sustainable Development. Cambridge University Press, Cambridge, pp. 181–201.
Carbone, M., 2007. Supporting or resisting global public goods? The policy dimension of a contested concept. Global Governance 13, 179–198.
Commission on Sustainable Development, 2001. Report on the Ninth Session (5 May 2000 and 16–27 April 2001). United Nations, New York.
Constanza, R., 1991. Ecological Economics: The Science and Management of Sustainability. Columbia University Press, New York.
Cosbey, A., Ellis, J., Malik, M., Mann, H., 2008. Clean energy investment. Project Synthesis Report. International Institute for Sustainable Development, Winnipeg, Manitoba. Online 15 January 2011, http://www.iisd.org/pdf/2008/cei_synthesis.pdf.
Daly, H.E., Farley, J., 2004. Ecological Economics: Principles and Applications. Island Press, Washington D.C.
ElBaradei, M., 2008. A global agency is needed for the energy crisis. Financial Times. Online 7 March 2011 http://www.ft.com/cms/s/0/b3630dd0-58b5-11dd-a093-000077b07658.html#axzz1Fw0wO0rv.
Farley, J., Aquino, A., Daniels, A., Moulaert, A., Lee, D., Krause, A., 2010. Global mechanisms for sustaining and enhancing PES schemes. Ecological Economics 69, 2075–2084.
Florini, A., Sovacool, B.K., 2009. Who governs energy? The challenges facing global energy governance. Energy Policy 37, 5239–5248.
Føllesdal, A., 1998. Survey article: subsidiarity. The Journal of Political Philosophy 6, 190–218.
G8, 2005. Gleaneagles plan of action. Climate Change, Clean Energy and Sustainable Development. Group of 8, Gleneagles.
Goldthau, A., 2010. Energy security and public policy. Some Implications for the Global Governance of Oil and Gas: Paper Presented at the Annual Convention of the International Studies Association, 18 February, New Orleans.
Goldthau, A., Witte, J.M., 2010a. Global energy governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin.
Goldthau, A., Witte, J.M., 2010b. The role of rules and institutions in global energy: an introduction. In: Goldthau, A., Witte, J.M. (Eds.), Global Energy Governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin, pp. 1–21.
Griffith-Jones, S., 2003. International financial stability and market efficiency as a global public good. In: Kaul, I., Conceição, P., Le Goulven, K., Mendoza, R.U. (Eds.), Providing Global Public Goods. Oxford University Press, Oxford, pp. 435–454.
Gururaja, J., 2003. Energy for sustainable development: review of national and international energy policies. Natural Resources Forum 27, 53–67.
Heinberg, R., 2006. The Oil Depletion Protocol: A Plan to Avert Oil Wars, Terrorism and Economic Collapse. New Society Publishers, Gabriola Island, Canada.
Hezri, A.A., Dovers, S.R., 2006. Sustainability indicators, policy and governance: issues for ecological economics. Ecological Economics 60, 86–99.
Huntington, H., Jojarth, C., 2010. Financing the future: investments in alternative sources of energy. In: Goldthau, A., Witte, J.M. (Eds.), Global Energy Governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin, pp. 161–181.
IISD, 2011a. Joint NGO Submission to the UN Conference on Sustainable Development, Rio+20: A Pledge to Phase Out Fossil-Fuel Subsidies. International Institute for Sustainable Development. Online 25 October 2011, www.iisd.org/pdf/2011/joint_ngo_submission_rio_plus_20.pdf.
IISD, 2011b. Summary of the Vienna energy forum 2011: 21–23 June. Earth Negotiations Bulletin 93.
International Energy Agency, 2007. Mind the Gap: Quantifying Principal–Agent Problems in Energy Efficiency. OECD/IEA, Paris.
International Energy Agency, 2008. World Energy Outlook. IEA/OECD, Paris.
International Energy Agency, 2009. World Energy Outlook. IEA/OECD, Paris.
International Energy Agency, 2010a. Energy Technology Perspectives. OECD/IEA, Paris.
International Energy Agency, 2010b. Transforming Global Markets for Clean Energy Products — Energy Efficient Equipment, Vehicles and Solar Photovoltaics. IEA/OECD, Paris.
Karakosta, C., Doukas, H., Psarras, J., 2010. Technology transfer through climate change: setting a sustainable energy pattern. Renewable and Sustainable Energy Reviews 14, 1546–1557.
Karlsson-Vinkhuyzen, S.I., 2010. The united nations and global energy governance: past challenges, future choices. Global Change, Peace and Security 22, 175–195.
Karlsson-Vinkhuyzen, S.I., Jollands, N., Staudt, L., 2009. Global energy policy: transforming governance for the transition to a sustainable energy future. Paper Presented at the International Energy Workshop, 17–19 June, Venice.
Karlsson, S.I., 2009. G8 climate action from Gleneagles to Hokkaido — dying flare or lasting flame? Paper Presented at the 50th Annual Convention of the International Studies Association, 15–18 February, New York.
Kaul, I., Conceição, P., 2006. The New Public Finance: Responding to Global Challenges. Oxford University Press, Oxford.
Kaul, I., Conceição, P., Le Goulven, K., Mendoza, R.U., 2003a. Providing global public goods. Managing Globalization. Oxford University Press, Oxford, p. 646.

Kaul, I., Conceição, P., Le Goulven, K., Mendoza, R.U., 2003b. Why do global public goods matter today? In: Kaul, I., Conceição, P., Le Goulven, K., Mendoza, R.U. (Eds.), Providing Global Public Goods. Managing Globalization. Oxford University Press, Oxford, pp. 2–20.
Kaul, I., Le Goulven, K., 2003. Institutional options for producing global public goods. In: Kaul, I., Conceição, P., Le Goulven, K., Mendoza, R.U. (Eds.), Providing Global Public Goods. Oxford University Press, Oxford, pp. 371–409.
Kemkes, R., Farley, J., Koliba, C., 2010. Determining when payments are an effective policy approach to ecosystem service provision. Ecological Economics 69, 2069–2074.
Lesage, D., Van de Graaf, T., Westphal, K., 2010. Global Energy Governance in a Multipolar World. Ashgate, Farnham.
Long, D., Woolley, F., 2009. Global public goods: critique of a UN discourse. Global Governance 15, 107–122.
Paavola, J., 2007. Institutions and environmental governance: a reconceptualisation. Ecological Economics 63.
Podobnik, B., 2002. Global energy inequalities: exploring the long-term implications. Journal of World-Systems Research VIII, 252–274.
Sagasti, F., Bezanson, K., 2001. Financing and providing global public goods: expectations and prospects. Study 2001:2 Prepared on Behalf of the Institute of Development Studies, Sussex, U.K. Ministry for Foreign Affairs, Stockholm, Sweden.
Scott, A., Peterson, J., Millar, D., 1994. Subsidiarity: a 'Europe of the regions' *v.* the British constitution? Journal of Common Market Studies 32, 47–67.
Selivanova, Y., 2010. Managing the patchwork of agreements in trade and investment. In: Goldthau, A., Witte, J.M. (Eds.), Global Energy Governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin, pp. 49–72.
Slavíková, L., Kluvánková-Oravská, T., Jílková, J., 2010. Bridging theories on environmental governance — insights from free-market approaches and institutional ecological economics perspectives. Ecological Economics 69.
Steiner, A., Wälde, T., Bradbrook, A., Schutyser, F., 2006. International institutional arrangements in support of renewable energy. In: Aßmann, D., Laumanns, U., Uh, D. (Eds.), Renewable Energy. A Global Review of Technologies, Policies and Markets. Earthscan, London, pp. 152–165.
Trachtman, J.P., 1992. L'etat, c'est nous: sovereignty, economic integration and subsidiarity. Harvard International Law Journal 33, 459–473.
UN-Energy, 2010. Un-energy: looking to the future. United Nations, New York. Online 1 November 2010, http://esa.un.org/un-energy/pdf/UN-Energy_Looking_to_the_Future_ebook.pdf.
UNIDO, 2009. Towards an Integrated Energy Agenda Beyond 2020. International Energy Conference, Vienna, Austria, 22–24 June 2009. Conference Report. United Nations Industrial Development Organization, Vienna.
United Nations, 2002. Report of the World Summit on Sustainable Development. Johannesburg, South Africa, 26 August–4 September. United Nations, New York.
van Lieshout, P., Went, R., Kremer, M., 2010. Less pretension, more ambition. Development policy in times of globalization. The Netherlands Scientific Council for Government Policy. Amsterdam University Press, Amsterdam.
Waide, P., Bernasconi-Osterwalder, N., 2008. Standards, Labelling and Certification. International Institute for Sustainable Development, Winnipeg. http://www.iisd.org/pdf/2008/cph_trade_climate_standards.pdf.
Zarrilli, S., 2010. Development of the emerging biofuels market. In: Goldthau, A., Witte, J.M. (Eds.), Global Energy Governance. The New Rules of the Game. Global Public Policy Institute and Brookings Institution Press, Berlin, pp. 73–98.