

RENEWABLE ENERGY AND DECENTRALIZATION (READ)

WORKING PAPER 3

Project EP/L002469/1, 2013-2015

BEYOND LITERACY AND KNOWLEDGE: ENERGY PROFICIENCY FOR DECENTRALISED GOVERNANCE

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July 2014

READ Renewable Energy and Decentralization



PRACTICAL ACTION



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1 INTRODUCTION

This working paper is an output of the **Renewable Energy And Decentralization (READ)** project, a research project (EP/L002469/1, 2013-2015) funded by the UK Engineering and Physical Sciences Research Council (EPSRC), the UK Department of International Development (DFID) and the UK Department for Energy and Climate Change (DECC), and executed by Loughborough University, Gamos Ltd and Practical Action East Africa.

Over the last ten years African governments have moved increasingly towards decentralised budgets, giving local authorities increased powers and budgets to govern areas that include both rural and urban population. Yet while cities have a municipal authority to consider new ways of supplying energy to its urban citizens, those governing Africa's rural poor in small and medium towns in the surrounding rural hinterlands have rarely considered energy infrastructure.

Existing research indicates that many local authorities in Africa are struggling with the capacities and capabilities necessary to govern the complex social, political and economic situations they routinely face. Required to contribute inter alia to financial management, local and regional economic development, strategic planning in the local government, budgeting procedures, tax collection, procurement procedures and standards, ethics for local government staff and elected representatives, and action against corruption, it is hardly surprising that against this backdrop the demands placed on their time and capabilities would see energy planning neglected. And yet energy - in particular, clean energy for development - is becoming increasingly important not just to them in their specific geographical location, but to the wider region and world more generally. The need for energy security, energy equity and environmental sustainability – the energy trilemma – are a pressing concern for all the world's citizens and the fragile global ecosystem (World Energy Council, 2013), but the actual application of energy policy often takes place at the hyper-local level under the influence of increasingly-decentralised actors.

In Working Paper 2 (Batchelor et al, 2014) for this series, we focused on the Decentralisation of Government in Africa. In order to understand the influence of local governments on clean energy transitions, we provided an overview of the literature on decentralisation in Sub-Saharan Africa. The paper reviewed definitions of decentralisation; traced the extent of decentralisation worldwide and in sub-Saharan Africa, including trends in its development, summarised the achievements, challenges, lessons learned in the past two decades; includes case studies of the process of decentralisation in six African countries; provided an inventory of typical responsibilities of local governments; and concludes with relevance to the wider decentralised energy project.

Our literature review identified that, whilst energy capabilities are a multi-scalar problem at local, national and international levels of governance, local authority capacity in many sub-Saharan African contexts poses a fundamental challenge for successfully implementing clean energy for development programmes. In short, decentralisation could open the way for local authorities to become champions and drivers towards cleaner energy, but at the same time, their lack of capacity and capabilities is currently proving a major barrier to implementing clean energy development in African states. The research project seeks to improve understanding and evidence base of both the opportunities and challenges associated with implementing clean energy for development in Africa.

Among all the other capacities and capabilities decentralized authorities must have to govern, the central question of this paper is, to what extent do they possess energy literacy? In the proposal, we followed the standard definition of an energy literate person (US DOE, 2013) as someone who: can trace energy flows and think in terms of energy systems; knows how much energy he or she uses, for what, and where that energy comes from; can

assess the credibility of information about energy; can communicate about energy and energy use in meaningful ways; is able to make informed energy and energy use decisions based on an understanding of impacts and consequences.

The original project proposal asked ‘what level of energy literacy does decentralised government need to implement clean energy transitions?’ In the process of conducting research on energy literacy and in-depth conversations with local authority officials, we have discovered that the terms ‘literacy’ and ‘knowledge’ carry unhelpful baggage. ‘Literacy’ in these contexts carries the connotation of a lack of education or a deficiency in the person’s life. The term ‘knowledge’ often implies an evidence-based, scientific type of knowledge, as demonstrated by the US Department of Energy definition above. The literature on policy frameworks discusses multiple ‘knowledges’ – different ways of knowing about something. This can be through reading scientific papers, but also by discussion and trust – relying on a friend to share accurate information. Therefore in this paper when the terms ‘literacy’ or ‘knowledge’ are used, we will critique the underlying unhelpful assumptions, and propose how literacy and knowledge apply to the context of local authorities in sub-Saharan Africa.

A term that more closely applies to what we mean by energy literacy is ‘proficiency’. As opposed to the associations of ‘literacy’ with knowledge and formal education, ‘proficiency’ implies skilfulness, expertise, capability and competence. In the literature ‘energy proficiency’ is used rarely, and tends to denote the performance and capability of machines or networks (see Sunavala, 1982; Chhabra and Vashisht, 2014). We propose that the term ‘energy proficiency’ is ideally-suited to our aims for this project in creating useful descriptions and inventories of what makes institutions and individuals capable managers of renewable energy.

In this paper then we draw on the literature and analysis of three distinct areas: 1) conceptions of the term literacy in other sectors and fields of work, 2) analysis of the current discourse on policy and acquisition of ‘multiple knowledges’, and 3) inventory and critique of current definitions and frameworks for energy literacy. Based on this deepened understanding, we propose a definition and general framework of energy proficiency for decentralised governance.

2 ON ACQUIRING LITERACY AND PROFICIENCY

2.1 TYPES OF LITERACY

In the past 25 years, the term ‘literacy’ has grown to encompass over 30 fields with a new type of literacy born almost annually. Grover (2002) presents a list of terms attached to the word ‘literacy’ and the frequency of their use online. Drawing on his brief analysis, we have grouped these many types of literacy into four categories (see Figure 2-1).

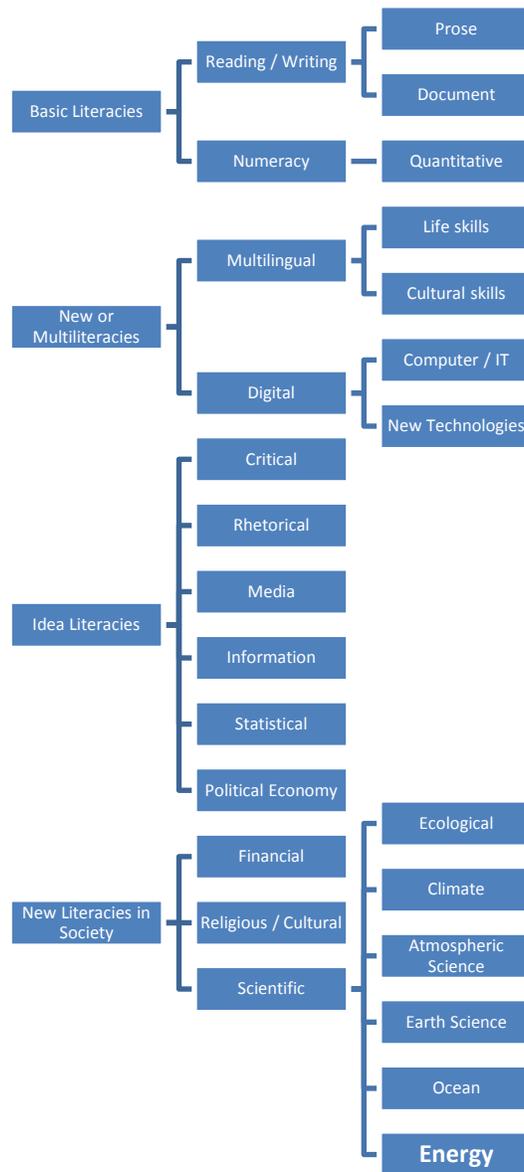


Figure 2-1 Categories and types of literacy

The term began as what is now known as ‘basic literacy’, encompassing areas of reading, writing and numeracy. The Information Age and expanding channels of communication led to the concept of new or multiliteracies (New London Group, 1996), including both the expanding areas of basic literacy enabled by new technologies (digital, multimedia) and the multi-lingual and multi-cultural nature of modern societies (Kalantzis and Cope, 2012). Rapidly-changing societies sparked the recognition of ‘idea literacies’ (our term), which we would define as ways that we organise or understand our context. These include critical literacy (how we read texts), media literacy (how we interpret media messages), information literacy (how we process information), statistical literacy (how we interpret statistics), and political economy literacy (understanding of the national and local production and distribution regimes which constrain local actors). The past 20 years in particular have seen an explosion in literacy as applied to specific competencies in society, ranging from financial (including ‘consumer’ and ‘investment’), religious and cultural (including ‘bible’ and ‘visual’), and scientific. Energy literacy was developed as one of these ‘new literacies in society’, and has been developed in a similar manner to other scientific literacies, such as ecological, climate, earth science and ocean literacy.

2.2 THE BOUNDARIES OF LITERACY

From a review of the literature on categories and types of literacy four recurring themes can be gleaned:

- 1) importance of context,
- 2) relationship to power,
- 3) link between basic and new literacies, and
- 4) importance of idea literacies in acquiring new literacies in society.

2.2.1 IMPORTANCE OF CONTEXT

The acquisition of literacy is highly defined by context. The growing recognition that knowledge is more than an autonomous competence separate from society led to an understanding of ‘literacy’ as being ideological, bound by social context and the values that influence that context (Goody, 1986). Even basic literacy or knowledge is now understood as ‘a set of socially-organised practices’ that are a part of our lives in work and community (Kral and Falk, 2003). For example, the U.S. National Assessment of Adult Literacy (2014) has organised these skills into three types -- prose, document and quantitative – and has identified seven types of skills (See Figure 2-2). These categories of a basic proficiency demonstrate the wide domains that encompass knowledge, skills and behaviours.

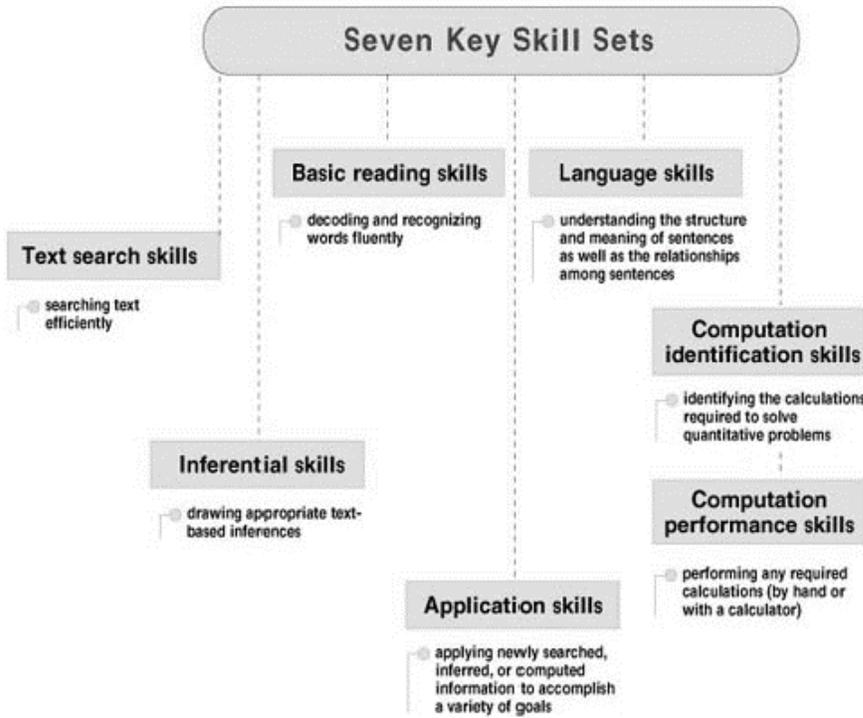


Figure 2-2 Seven types of skills in basic literacy NAAL (2014)

2.2.2 RELATIONSHIP TO POWER

The acquisition of knowledge imbues power in many situations, and a knowledgeable person has greater access to social and material resources (Krall, 2011). In a review of studies on decentralisation and development, LDI (2013) finds that higher citizen literacy about local governance increased the ability for citizens to hold institutions accountable, and increased the effective functioning of government (see Johnson 2001). In the sub-Saharan African context some studies have noted a link between access to improved service delivery in sub-Saharan Africa and technical literacy of citizens (Cabral, 2011). Others note that low technical knowledge of local authority officials, such as difficulty in responding to citizen requests, or to comply with standards, contributes to low capacity and poor functioning of government (Dickovick et al, 2010). These findings are not conclusive and raise a series of questions about a definitive link between local capacity and improved outcomes, but for the purposes of this paper we propose that the capability of local authority officials would have some relationship to the ability to provide better services.

2.2.3 LINK BETWEEN BASIC AND NEW LITERACIES

Basic 'literacy' and new knowledge are correlates, but basic literacy is not necessarily a pre-requisite for other literacies. The absence of basic literacy is generally correlated with lower income levels, as do the absence of other types of literacy such as political and financial (Cabral, 2011; Johnson, 2011).

Although other types of literacy are not necessarily dependent on basic literacy, the Rwandan government (2013) in its Economic Development and Poverty Reduction Strategy links courses in basic literacy with a national financial

literacy campaign for 3 million citizens. They propose that this joint strategy will reduce dependence and increase participation and savings.

Other authors have emphasised that basic written literacy is not necessarily a prerequisite for other literacies. For instance in a study on health literacy and vocational training for a pre-literate Indigenous Australian community, Kral (2011) argues that the acquisition of knowledge should fit into the social context, incorporating oral traditions and communal practices of learning and transmitting knowledge and social norms.

2.2.4 IMPORTANCE OF IDEA LITERACY IN ACQUIRING NEW LITERACIES IN SOCIETY

Relevant idea literacies are often incorporated into the acquisition of new proficiencies. For example, scientific knowledge would necessarily involve an understanding of how to find and interpret information (information literacy), and also how to interpret statistics (statistical literacy). Thus in definitions in the category of ‘new literacies in society’ such as energy literacy, key elements of idea literacies such as ‘political economy literacy’, ‘critical literacy’ and ‘media literacy’ should be included as an essential part of its acquisition.

2.2.5 APPLICATION TO ENERGY PROFICIENCY

These four themes of literacy acquisition can be applied to an understanding of energy proficiency in our project as depicted in Table 2-1.

Defined by context:	Energy proficiency should be tailored to the specific context of local authority officials in sub-Saharan African countries and as much as possible applied to the specific needs and issues of those groups. It should also take into account the national political economy which constrains their power and influence.
Relationship to power:	Assessment of energy proficiency should be linked to access to resources and ability to implement changes in behaviour. When possible attention to power dynamics in acquisition of energy proficiency can help to clarify limitations on impact.
Basic literacy correlates:	The level of basic literacy of individual consumers and local authority officials should be taken into account in developing materials for energy proficiency. Attention to literacy acquisition appropriate to that context (modes of learning and decision-making) should be sought.
Incorporating ideas :	Information literacy and political economy literacy in particular are highly relevant to energy proficiency so the definition and framework should incorporate those elements (see the next section for details on information literacy).

Table 2-1 Applying themes in literacies to energy proficiency

2.3 RELEVANT TYPES OF LITERACY TO ENERGY PROFICIENCY

In this section there is a brief overview of elements of idea and new knowledge literacies that have the greatest relevance to creating a definition of energy proficiency.

2.3.1 INFORMATION LITERACY AND KNOWLEDGE MANAGEMENT

The definition of information literacy most relevant to energy transitions is given by the Chartered Institute of Librarians and Information Practitioners: ‘knowing when and why you need information, where to find it, and how to evaluate, use and communicate it in an ethical manner.’ (CILIP, 2013).

These skills overlap with knowledge management, which is a growing field in both policy and development circles examining the quality, accuracy and applicability of knowledge available to policymakers. Knowing ‘resources available’, and ‘how to find information’ relate to the concept of an information ecosystem (Batchelor, 2012) and ‘how to communicate and share findings’ and ‘how to manage findings’ is a key element of applying types of knowledge to improving policy debates (Jones et al, 2013). As information and knowledge management in the context of policymakers is complex, the role of evidence in policy debates is further explored in Section 3.

2.3.2 SCIENTIFIC AND ENVIRONMENTAL LITERACY

As mentioned above, the concept of ‘energy literacy’ was developed in the West as an element of scientific literacy, along with ecological, climate, earth science and ocean literacy. Like these, its content is largely scientific and part of its acquisition could take place in a classroom as part of a science curriculum. Other related literacies are technological and environmental (see DeWaters and Powers, 2013). Environmental literacy is made up of knowledge, dispositions, competencies, and behaviours (notably Environmentally Responsible Behaviour), which mirrors frameworks subsequently created for energy literacy described in Section 4.

These apparent ‘scientific’ inventories of energy literacy mask the fact that concepts of energy are bounded by the socio-political context in which they are formed. In the Global North, this has often assumed that energy should be provided in an unlimited fashion to support mass consumption. For this reason, energy literacy fits uneasily in this family of literacies as it not only about understanding scientific concepts, but about policy decision on how to best utilise limited resources in a sustainable manner.

2.3.3 PUBLIC HEALTH LITERACY

Of the myriad of new literacies in society, the one that most directly relates to the type of energy proficiency desired in this study is public health literacy. In a recent comprehensive overview of public health literacy, Freedman et al (2009) defines it as ‘the degree to which individuals and groups can obtain, process, understand, evaluate, and act on information needed to make public health decisions that benefit the community.’ Public health is divided into three dimensions -- conceptual foundations, critical skills, and civic orientation – and includes a range of competencies. This type of public health literacy is distinguished from basic health literacy, which is defined at the level of the individual, to a view on what is best for communities and societies. The communal element is highly relevant to the context of the READ project, where proficiency should apply to individuals who are working on behalf of a larger good rather than simply maximising personal choices, the primary focus of energy literacy in the literature thus far. However, it should also be noted that policy choices for energy do not necessarily

mirror those in public health. Improved energy use will not necessarily result in the best public good unless policies harness improved energy for the benefit of citizens.

3 THE ROLE OF POLICY MAKING IN PROFICIENCY

For each of the above (Section 2.3), there is an assumption that information, such as facts, figures and scientific data, is influential on a decision making process. Behind the definition that ‘individuals and groups can obtain, process, understand, evaluate, and act on information’ lies the assumption that individuals and groups **want** information in order to understand, evaluate and act. There is a body of work that questions whether ‘scientific information’ is the key influencer among policy actors.

3.1 EVIDENCE IN POLICY MAKING

Evidence in policy making is generally associated with research, and is sometimes called research uptake. There is now a wide-ranging literature that attempts to grapple with the challenges of documenting research uptake, influence, and policy change. Useful insights can be drawn from recent work in different fields, including: 1) research and policy linkages (e.g. Start and Hovland 2004); 2) Diplomatic efforts (e.g. Steven 2007); 3) advocacy by civil society organisations (e.g. O’Flynn 2009); and 4) impact evaluations (e.g. CIPPEC 2010). Based on this literature and others (such as Jones 2011), we can say that it is often difficult to determine the links between influencing activities and changes in policy (particularly ex ante). Policy change is highly complex, and not suited to so-called linear or rational models. More commonly, policy processes are shaped by a multitude of interacting forces and actors. Therefore proficiency on a particular subject, does not mean that the known information is the main driver to a decision, without an understanding of how to apply knowledge in a policy environment.

The use of evidence, such as scientific information, is therefore not necessarily constrained by information literacy per se, but by other barriers and drivers that emerge as a part of the policy debating process. Jones et al (2011) state that different types of knowledge influence policy debates based on the context and setting. Figure 3-1 depicts how these types of knowledge relate to influencing policy debates. In the context of energy systems, the dominant narrative of how energy should be produced and distributed can constrain how knowledge about energy is acquired and applied to policy. For example, in Western countries the dominant energy system is a centralised grid system, which is accompanied by an assertion that this form of energy is the most modern and advanced, in contrast to the evidence that centralised energy both increases energy waste and can impede transition to renewable energy (see Lawrence Livermore National Laboratory, 2013). This example demonstrates that the types of knowledge accessed and the incentives used can also facilitate or constrain the application of factual knowledge about energy to generate actual energy policy.

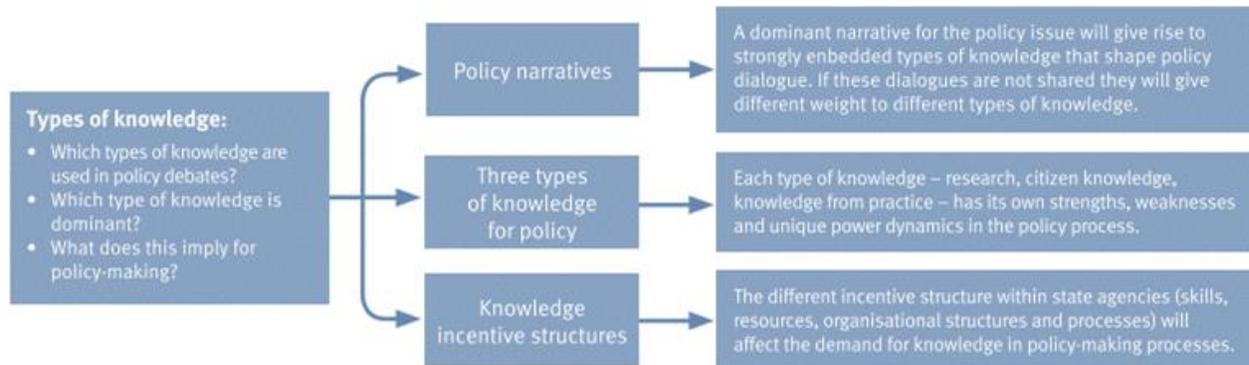


Figure 3-1 Analysing how different types of knowledge influence policy debates Jones et al (2013)

3.2 DRIVERS AND BARRIERS TO INFORMATION INFLUENCE

Even in an evidence-based field like the health sector, there are common and persistent barriers to using evidence as a basis for decision making. An understanding of these barriers and drivers is crucial to determining the influence of new information on decision-making. Oliver et al (2013) categorises barriers to and facilitators of the use of evidence by policymakers. Table 3-1 presents the top five barriers and facilitators, and a full list is given in Annex A. It is notable that ‘policymaker research skills’ (proficiency) while mentioned in 65 of the 113 studies is only one element in the complex landscape that is policy formation.

Most frequently reported barriers to and facilitators of the use of evidence (n = # studies in which factor reported)	
Top 5 barriers to use of evidence	Top 5 facilitators of evidence use
Availability and access to research/improved dissemination (n = 63)	Availability and access to research/improved dissemination (n = 65)
Clarity/relevance/reliability of research findings (n = 54)	Collaboration (n = 49)
Timing/opportunity (n = 42)	Clarity/relevance/reliability of research findings (n = 46)
Policymaker research skills (n = 26)	Relationship with policymakers (n = 39)
Costs (n = 25)	Relationship with researchers/info staff (n = 37)

Table 3-1 Barriers to and facilitators of the use of evidence Oliver (2013)

A major finding of this study is the importance of relationships and capacity. It is often the relationship between the holder of the evidence and the relevant policy actor that strongly influence whether information influences the decision. Shiffman (2009) identifies that the ‘rise, persistence and decline of a global health issue may best be explained by the way in which its policy community – the network of individuals and organizations concerned with the problem – comes to understand and portray the issue and establishes institutions that can sustain this portrayal’. The focus of his analysis is on the policy community and the capacities to respond to an issue. Pelletier et al 2011 further unpack the idea of a policy community. They contrast high-level political attention which they state can be generated in a number of ways, with the generation of political commitment and system commitment. The latter they suggest requires sustained efforts from policy entrepreneurs and champions. They note the role of mid-level actors who are seeking to translate policy into operational plans, and again point to capacity constraints, ownership, roles and responsibilities. The idea of capacities is further picked up in their study,

with the researchers finding that ‘the pace and quality of implementation was severely constrained in most cases by weaknesses in human and organizational capacities from national to frontline levels’ (Pelletier et al, 2011).

This move away from standard linear diffusion models, brings to focus a more sophisticated understanding about how ideas spread (more like epidemics), why some ideas start (and others do not), and what can be done to deliberately control positive epidemics – to reach a moment of critical mass, a threshold, or boiling point (Sumner et al, 2009; Gladwell 2000; Gardner 2006). In short, there needs to be a shift from an information and evidence - based approach, to one about relations, networks and politics (see **Error! Reference source not found.3-2**).

Figure 3-2 Different approaches to knowledge and influence Developed from Sumner et al (2009:14)

Such an understanding of the research-policy praxis suggests that energy literacy (indeed any of the new literacies in society) need a conceptual framework that understands the **actors** (policymakers, researchers, and intermediaries), the **connections/ relationships** between the actors, the **message** (evidence, credibility, etc.) as well as the **policymaking context**. There are several frameworks that depict policy elements in different ways with slightly different emphasis (e.g. Court and Young 2003; Wolmer et al 2006; Steven 2007). Latour (1996) offers a particularly useful concept of actor-networks, noting that this level of analysis flattens the distinction between the relative size of institutions (networks are measured not by size but by strength and number of connections) and geographical distance (networks are borderless and can be both global and local). Writers such as Sumner et al (2009) echo these statements about networks, context and trust: *“While there is no consensus in the literature about what factors affect the impact or influence of development studies research, three factors nevertheless emerge that appear to support greater research impact and influence. One is the ‘stickiness factor’ – stickiness means that a message makes an impact. Another is the importance of building networks, coalitions for change, and ‘knit-working’ groups. The third is strategic opportunism, or the role of mapping contexts to identify windows of opportunity for impact/ influence, not forgetting the role of serendipity!”*

In Figure 5 we bring together two frameworks on research-policy praxis. The framework developed by Court and Young (2003) sees research uptake as a function of the interaction of *context* (politics and institutions), *evidence* (approach and credibility), and *links* between researchers and policymakers. The framework developed by Wolmer et al 2006 identifies three overlapping perspectives - rooted in different schools and disciplines. **Knowledge and discourse:** What is the ‘policy narrative’? How is it framed through science, research etc.? **Actors and networks:** Who is involved and how they are connected? **Politics and interests:** What are the underlying power dynamics? These questions echo the context and relationship to power identified in Section 2.2.2 as key to ‘proficiency’.

Both broad frameworks agree that the research-policy link is strongly influenced by the political context; with research-based evidence more likely to contribute to policy if it fits within the political limits, institutional pressures, and vested interests that are influencing the policy environment. Callon coined the term ‘agencements’ (Muneisa et al, 2007) to describe this complex relationship between actors and socio-technical devices within the wider social, cultural and political spaces where they interact (Hall, 2010). In other words, we have to acknowledge that the dynamics of energy provision, and the process of translating those dynamics into action, is a highly political one and is not dependent on the strict criteria of a scientific frame. These ideas also draw particular attention to the importance of **discourse and narratives**. These ‘policy narratives’ often gain validity despite (or even because of) the fact that they frequently simplify complex issues and processes. As Wolmer et al (2006: 9) points out: *“This is what makes simple narratives appealing to politicians or managers – sweeping people along. Some narratives tend to gain more authority, persisting at the expense of others, and hence have more bearing on policy decisions – but these will often be contested by alternative policy narratives that frame problems and solutions in different ways”*.

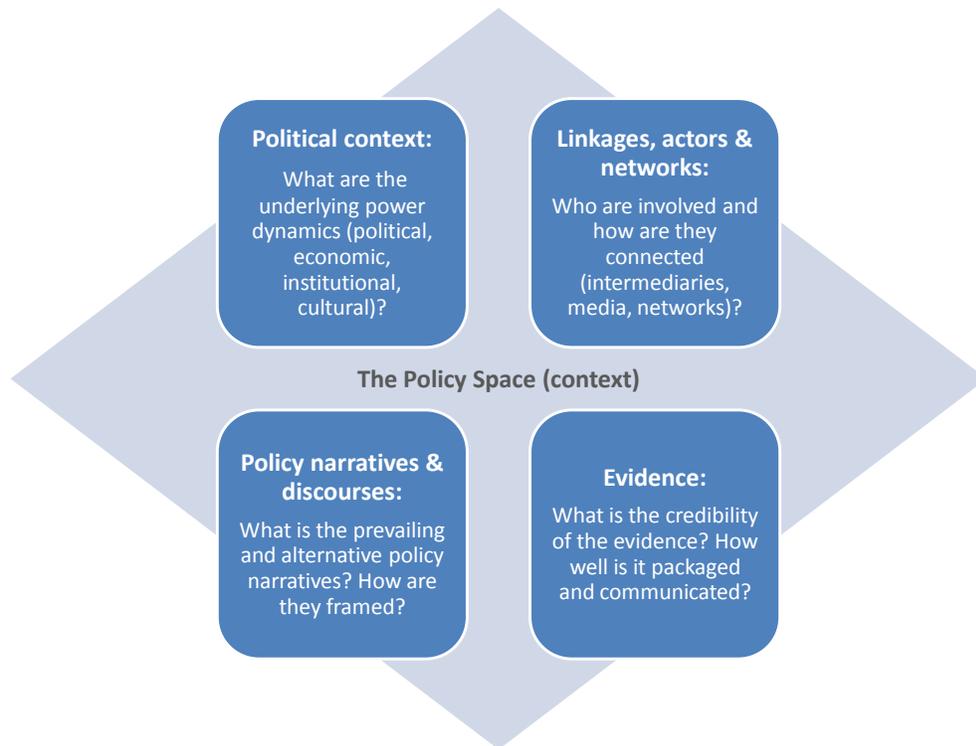


Figure 3-3 Adapted framework of research-policy praxis Developed by authors, based on Court and Young (2004); Wolmer et al (2006); and Sumner et al (2009)

To address this complex relationship, Steven (2007) suggests breaking down the concept of policy change into a number of different types of influence. This definition moves beyond simply typecasting policy change as the passing of key legislation or the issuing of a new government policy statement, and instead defines policy change as including: 1) Changing perceptions and public opinion; 2) Setting an agenda by reframing the way an issue is debated and creating pressure for change; 3) Building networks that support delivery of change; 4) Developing capacity within organisations to allow them to understand and respond to an issue; and 5) Changing institutions,

such as influencing strategy and resource allocations within an organisations (often government, but may be private sector) (Steven, 2007: 9-15).

An understanding of drivers and barriers to the influence of information leads to two conclusions for an understanding of energy literacy. First, the influence of research is not only about the quantity and quality of the research produced, but more importantly about changing minds through dialogue and exchange. This suggests that any 'energy proficiency' is not confined to facts and figures on energy consumption and supply. Rather to utilise 'proficiency' in any meaningful way, a local authority would need their capacity enhanced by dialogue and exchange. The actualisation of the information in dialogue makes it knowledge and influential. Second, when we consider the role of energy in decentralised local authorities, any action is likely to be most effective if the idea of 'energy proficiency' is situated into the broader policy framework of dialogue, discourse, and actor networks.

3.3 INDIVIDUAL DECISION-MAKING: AN ADDED COMPLICATION

While situating proficiency into a policy framework in itself makes any discussion of 'multiple knowledges complex, zooming in from the wider environment of policy debates to the responses of each individual reveals another set of influencing factors (Dietrich, 2010). Factors influencing an individual's decision making include past experience (Juliussen, Karlsson, & Gärling, 2005), cognitive biases (Stanovich & West, 2008), age and individual differences (Bruin, Parker, & Fischhoff, 2007), belief in personal relevance (Acevedo, & Krueger, 2004), and an escalation of commitment, influence what choices people make.

Individuals develop patterns of thinking called heuristics that enable them to come to a decision quickly and easily (Dietrich, 2010). However these patterns may or may not be useful. In some cases an established decision pattern can put to one side new evidence, which happens frequently in policy decision making processes, whether the policy actor is aware of it or not. Life experiences influence the decision heuristic, by both making similar successful decisions (Juliussen et al 2005) and avoiding past bad decisions (Sagi, & Friedland, 2007). Observations and generalisation based on life experience also tend to give people a cognitive bias that can lead to faulty and inaccurate judgements (Evans, Barston, & Pollard, 1983; West, Toplak, & Stanovich, 2008). These and other life experiences with decision-making frameworks (such as risk strategies) lead people to create heuristics in their minds.

Three important types of heuristics are representative, availability, and anchoring and adjustment (Dietrich, 2010). The representative heuristic is the idea that people tend to choose recognised things over unrecognised ones (Pachur and Hertwig, 2006). The availability heuristic describes the tendency to retrieve the information that is the most readily available (Redelmeier, 2005). The anchoring and adjustment heuristic describes how people make decisions involving an estimate of value, beginning with an anchor (ballpark estimate as a starting point) and adjust this estimate until a satisfactory answer is reached (Epley & Gilovich, 2006). These heuristics highlight the boundaries on how individuals use information and need to be taken into account in understanding how information is processed and applied.

3.4 APPLYING POLICY-MAKING TO ENERGY PROFICIENCY

Batchelor (2011) brings these factors together into a statement on how evidence might be used within policy debates in Figure 3-4.

$$\left(\frac{\text{Scientific Study}}{\text{Quality} \times \text{Trust of Source}}\right)(\text{Qualitative Data} + \text{Quantitative Data}) + \frac{\text{Intuition/heuristics}}{\text{Own Life Experience}} \times \frac{\text{Other Life Experience}}{\text{Closeness of Other}} \\ + \left(\frac{\text{Desired Outcome} \times \text{Political Economy} \times \text{Power relations}}{\text{Personal Interests} + \text{Group Interests}}\right) \times \int \text{Emotional Responses} \\ = \text{Evidence Influenced Decision Making}$$

Figure 3-4 Formula for evidence influenced decision making Batchelor (2011) added to and adapted in this paper

Recognising that it is not possible to reduce the complexity of decision-making to a mathematical formula, the figure demonstrates that information literacy comprises one small but influential part of the whole. The ability to access a scientific study and interpret the qualitative and quantitative data is itself strongly influenced by the trust assessment applied by the individual or group to such a study. The outcome – how we process information – is not solely based on that one factor. Each individual’s decision on the influence of evidence is strongly influenced by the person’s life experience and their own heuristic development, as well as by the actor networks and by dialogue between actors. The attitude to one’s own outcome beliefs is dependent on the influence of social referents and the value one attributes to them as discussed in the theory of planned behaviour (Ajzen, 2008). An individual’s assessment of the evidence is then constrained and shaped by larger political economy factors including power relations and various group interests.

We therefore need to proceed to the next section on energy proficiency with this understanding that increasing local authority energy literacy is only one factor in each individual’s decision making and in working towards a particular policy environment.

4 ENERGY LITERACY: REVIEW OF DEFINITIONS AND FRAMEWORKS

This section provides an inventory and critical engagement with common definitions and relevant frameworks for energy literacy. These will form the groundwork in Section 5 for the creation of a definition and a set of frameworks for energy **proficiency** in local authorities.

4.1 DEFINITIONS OF ENERGY LITERACY

In order to develop an understanding of energy proficiency, we conducted a literature review of relevant studies on the term energy literacy and its application. Annex B presents the major characteristics and findings of these studies. In seven of the 12 studies reported, the term energy literacy is not used, although the areas covered clearly relate to elements of energy literacy. When the term energy literacy is used thus far, it almost always: 1) refers to individuals, 2) is focused on conceptual knowledge or consumption of energy, and 3) is applied to academic contexts (schools and universities) or individual consumers. This bias is reflected in the definitions, frameworks and tools that are currently available.

In the context of the Sub-Saharan African countries, the term energy literacy has not been used much if at all. Instead, reports on energy initiatives by the World Bank in Ethiopia (Mohan 2007) and the UN (2011) in Botswana make sweeping assumptions about challenges of capacity and technical proficiency of government and energy company officials and offer a remedy of technical training and support to improve energy outcomes. The Republic of South Africa (2012) conducted a comprehensive survey of energy behaviours and perceptions of individual consumers at the district level. This provides a useful dataset as well as a range of questions that local authorities could ask to understand how citizens can participate in implementing decentralised energy initiatives.

The most comprehensive definition of energy literacy comes from the U.S. Department of Energy: ‘Energy literacy is an understanding of the nature and role of energy in the universe and in our lives. Energy literacy is also the ability to apply this understanding to answer questions and solve problems.’ (2013, p. 1). Dwyer (2011) proposes a definition of energy literacy as ‘conceptual fluency with the economic and social components of energy use’, which will ideally produce ‘environmentally responsible behaviour’. This provides a useful link between knowledge and behaviour in line with sustainability.

Paulos and Pierce (2011) focus on the dynamic of citizen participation in energy use with the concept of citizen energy. ‘In citizen energy the public is conceived as active rather than passive stakeholders in the energy system evolution, and the potential for action is framed by notions of equitable rights and responsibilities across a society dealing with the consequences of energy consumption, notably climate change’ (p. 1). Participation would need to be a key theme of an energy proficiency definition. The public health definition includes the individual and group levels as ‘the degree to which individuals and groups can obtain, process, understand, evaluate, and act on information needed to make public health decisions that benefit the community’ (Freedman et al, 2009).

4.2 FRAMEWORKS FOR LOCAL AUTHORITIES

In creating a framework for energy proficiency for local authority officials, some existing frameworks could be useful in laying the groundwork for this project. This section provides an overview of the process for developing frameworks, general energy frameworks, and frameworks for implementing change, and concludes with a proposed general energy proficiency framework.

4.2.1 PROCESS FOR DEVELOPING A FRAMEWORK

The READ project is incorporating a participatory approach to defining and assessing energy proficiency, as described in the project proposal:

“WP 3 Convene local authority multi-stakeholder workshops in Kenya and Rwanda – to scope existing knowledge and energy framing. Bringing together work packages 1 and 2, we will convene a multi-stakeholder workshop in Kenya and Rwanda. This will seek to bring together local authorities in the two countries, using Participatory Market Mapping (PMM) processes to discuss their current understanding of their responsibilities, the role of energy in their plans and their stated needs for capacity building. These workshop and the key informant interviews surrounding them will form the basis of case studies that illustrate the capacity needs related to energy of local authorities. These may include possible piloting of repurposed energy literacy material to assess their appropriateness and potential impact.”

This approach agrees with the literature on frameworks for energy literacy currently in use. In the creation of the U.S. Department of Education definition of energy literacy, a process of consultation included email consultation with 300 key stakeholders, community meetings, a wiki page, chat board, and input from federal agencies and

academic researchers on the final language (US DOE, 2013). Lee (2011) used Nominal Group Technique, a group process involving problem identification, solution generation, and decision making, to develop a definition of energy literacy that was appropriate a group of Taiwanese students.

The project proposal suggested the participatory approach of Practical Action, an NGO in South Africa, which have developed a “Participatory Market System Development” (PMSD) approach for engaging with a wide range of stakeholders in the energy sector including suppliers, producers, processors, vendors and end users. This process is based on three core principles: 1) systems thinking, which is understanding relationships and interactions between parts of a system; 2) participation, working with key players to ‘implement collaborative strategies and actions that will improve how the system functions’; and 3) facilitation, defined as ‘as creating the conditions for public and private market actors to drive change themselves’ (Practical Action, 2014).

In incorporating systems thinking, Stephenson et al (2010) provides a framework for assessing external influences which can enable behaviour change in energy use (see Figure 4-1). This type of mapping to an agreed framework could be useful, with an added awareness of the context of national energy systems.

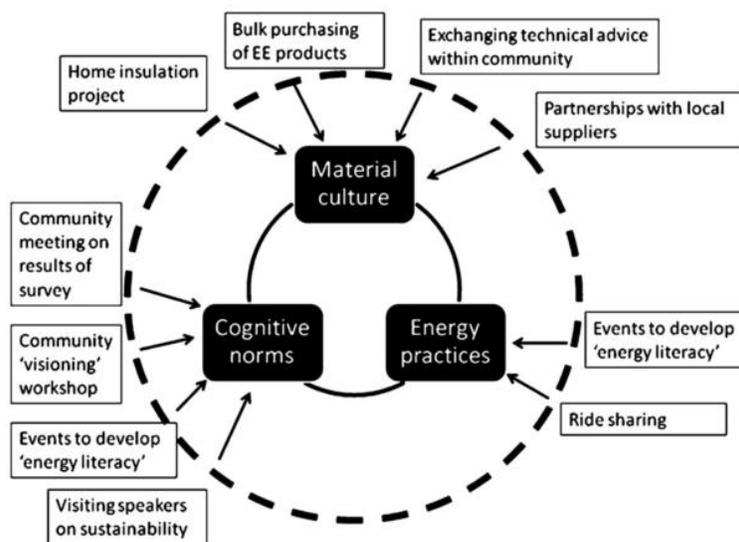


Figure 4-1 ‘Using the Energy Cultures framework to illustrate some of the external influences which enabled behaviour change in Waitati. Changes in any aspect of material culture, cognitive norms or energy practices may directly or indirectly influence other aspects’ (Stephenson et al, 2010).

As a participatory process, it is important to include the input of individual citizens as well as local authority officials. This idea of participation is supported by Paulos and Pierce (2011) in a concept called ‘Citizen Energy’, where ‘potential for action is framed by notions of equitable rights and responsibilities across a society dealing with the consequences of energy consumption, notably climate change’. The ultimate beneficiaries of improved energy are citizens, and their needs and interests should factor into an understanding of literacy needed by local authority officials.

The quality of citizen participation should be reliant on specifically energy orientated programmes of engagement. Batchelor et al (2003) explores various dimensions of energy awareness through a participatory framework, with a target audience of agricultural and general community extension agents conducting participatory exercises with

their clients. The hypotheses for their research include: 1) Energy is an important aspect of life and livelihoods and forms a cross cutting need for all development activities, 2) Participatory processes are essential, 3) There are few recorded and reported examples of where energy issues are expressed as a need resulting from participatory processes. Batchelor et al (2003) generate evidence to support these assumption, concluding that energy does not feature as a reported need because the facilitators of participatory processes themselves are not sufficiently aware of the impact of energy on livelihoods to ask the right questions of the communities. They note that ‘outputs from participatory processes often depends on the facilitator. A framework is created within which the community undertakes an exercise of participation. While in theory the framework should be open to include all needs, in practice it is often circumscribed - health workers will tend to get a greater feedback on health, agriculturalists on agriculture, etc. The response depends on the skills, awareness and interests of the facilitating extension worker’. They suggest that skills and awareness of workers facilitating participatory processes depend largely on the training given, which is in turn governed by the remit of their parent organisation. If energy is not included in the training, it is unlikely to be recognised by either extension worker or village as a need. The project went on to examine the main training texts and the training curriculum in more than 28 institutes and demonstrated that energy concerns were not included at that time (2002, and with the exception of two institutions). The project also undertook some consultations on energy awareness among local government, health and agriculture professionals and Non-Government Organisations in Ghana and India. Their energy awareness was captured in a simple exercise. Participants were broken up into three groups, with each group preparing a list of what they had consumed for breakfast that morning. The instruction to list breakfast consumption items had led participants to focus mainly on food items. As expected, none of the groups had mentioned an energy aspect such as cooking, which would have been necessary to prepare the food.

4.2.2 GENERAL FRAMEWORKS

Although the specifics of the framework should be developed with key stakeholders, a general framework for what energy proficiency could entail will help to guide the process.

The US Department of Energy defines an energy-literate person as someone who:

‘can trace energy flows and think in terms of energy systems; knows how much energy he or she uses, for what, and where the energy comes from; can assess the credibility of information about energy; can communicate about energy and energy use in meaningful ways; is able to make informed energy and energy use decisions based on an understanding of impacts and consequences; and, continues to learn about energy throughout his or her life’ (US DOE, 2013). It is based on seven principles for learning about energy: ‘1) Energy is a physical quantity that follows precise natural laws, 2) Physical processes on Earth are the result of energy flow through the Earth system, 3) Biological processes depend on energy flow through the Earth system, 4) Various sources of energy can be used to power human activities, and often this energy must be transferred from source to destination, 5) Energy decisions are influenced by economic, political, environmental, and social factors, 6) The amount of energy used by human society depends on many factors, and 7) The quality of life of individuals and societies is affected by energy choices’ (US DOE, 2013).

We note in this framework the emphasis on the individual and also the academic context of the acquisition of energy literacy. However there are useful elements for the purposes of the project, including the ability to think in terms of energy systems, assess energy information, communicate about energy, and make informed decisions.

One of the most comprehensive frameworks is found in DeWaters and Powers (2008) as depicted in Figure 4-2. The three attributes [cognitive (knowledge, cognitive skills), affective (attitude, values, personal responsibility);

and behavioral] could translate well as general frameworks. Characteristics could be developed based on an initial understanding of the context and adapted with input from local stakeholders, and the benchmarks could be developed in partnership with stakeholders in each local context.

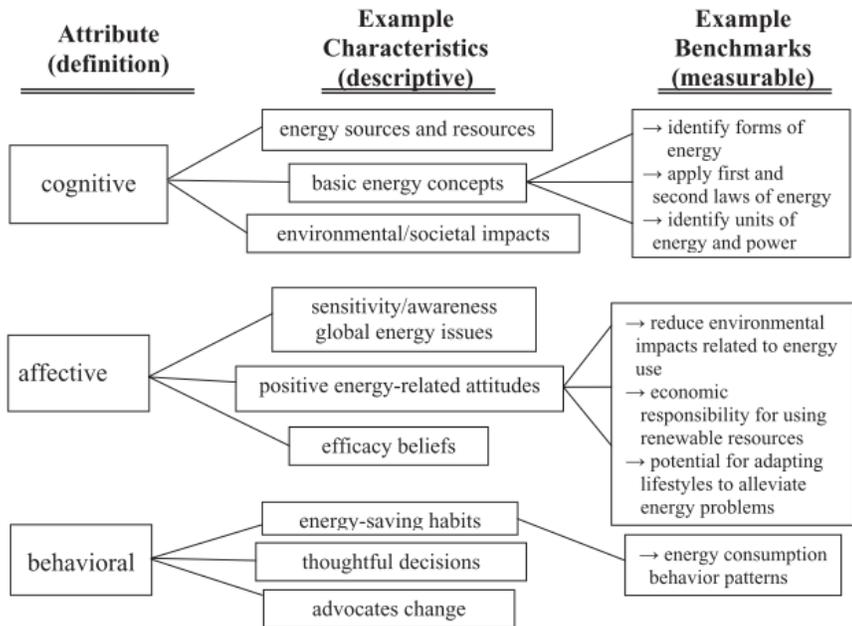


Figure 4-2 Framework for energy literacy DeWaters and Powers (2008)

Drawing from the framework for public health literacy (Freedman et al, 2009), dividing the framework into three dimensions could be useful. We include the details of those in their entirety as they quite naturally translate into energy proficiency for local authority officials. The third dimension would be particularly important in ensuring that learning is applied to the benefit of citizens and society.

Dimension 1: Conceptual Foundations: The conceptual foundations dimension includes the basic knowledge and information needed to understand and take action on public health concerns. An individual or group demonstrating public health literacy at a conceptual level is able to define and discuss: 1) core public health concepts such as primary prevention, health promotion, and population health; 2) public health constructs such as prevalence, risk factors, probability, and ORs, and the relationship of each of these to morbidity and mortality; and 3) ecologic perspectives and the multiple pathways through which disease is transmitted and health is promoted.

Dimension 2: Critical Skills: The critical skills dimension relates to the skills necessary to obtain, process, evaluate, and act upon information needed to make public health decisions that benefit the community. An individual or group demonstrating public health literacy on this dimension is able to: 1) obtain, evaluate, and utilize public health information from a variety of sources (e.g., health practitioners, media, social networks); 2) identify public health aspects of personal and community concerns (e.g., urban planning, agricultural practices, violence); 3) communicate information about health conditions and actions (e.g., smoking, obesity, handwashing) not only as a personal concern but also as a problem affecting the larger community; and 4) assess who is naming and framing public health problems and

solutions and describe the ways in which such framing is biographically, culturally, spatially, temporally, and institutionally bounded.

Dimension 3: Civic Orientation: The civic orientation dimension ensures that “the public” remains at the centre of public health literacy and includes the skills and resources necessary to address health concerns through civic engagement. An individual or group demonstrating public health literacy from a civic perspective is able to: 1) articulate that the burdens and benefits of society are not fairly distributed; 2) evaluate who benefits and who is harmed by public health efforts or lack thereof; 3) communicate that current public health problems are not inevitable and can be changed through civic action; and 4) address public health problems through civic action, leadership, and dialogue. (Freedman et al, 2009)

Incorporating key elements of information literacy would also be essential. In particular, knowing ‘resources available’, ‘how to find information’, ‘how to communicate and share findings’ and ‘how to manage findings’ are relevant (CILIP, 2013). Finally, an understanding of the socio-political context and the constraints of national energy systems would need to feature in the specific type of energy proficiency required by local authorities.

4.2.3 IMPLEMENTING AND SHARING LEARNING

A key element of energy proficiency frameworks should involve implementing and sharing learning. UN Foundation (2012) has proposed an accountability framework in its Sustainable Energy for All initiative which could be useful to follow in order to ensure that local changes tie into global initiatives. See Figure 4-3 for a depiction of this change.

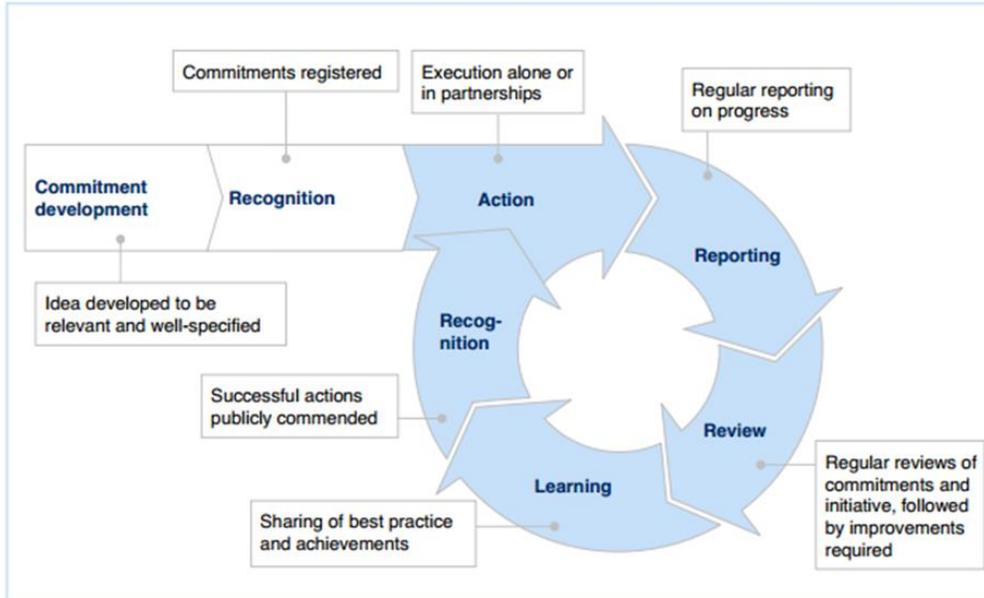


Figure 4-3 Framework for action on sustainable energy UN Foundation (2012)

The energy proficiency framework and materials to be developed should also take into account two global movements: the UN Sustainable Energy for All initiative (2012), and the global movement toward renewable energy as exemplified by the Renewable Energy and Energy Efficiency Partnerships (REEEP, 2014) and the Renewable Energy Policy Network for the 21st Century (REN21, 2014). In particular, the Sustainable Energy for All

Initiative is a global platform to promote three objectives: '1) Ensure universal access to modern energy services, 2) Double the global rate of improvement in energy efficiency, and 3) double the share of renewable energy in the global energy mix' (SE4all, 2014). To achieve over 50 High Impact Opportunities have been identified, with relevant opportunities for this project including 'Building Energy Efficiency' and 'Sustainable Bioenergy' (SE4all, 2014). This project could link with other stakeholders at the national and international level to share learning and encourage behaviours that are effective.

5 PROPOSED DEFINITION AND GENERAL FRAMEWORK: ENERGY PROFICIENCY FOR DECENTRALISED GOVERNANCE

Based on the definitions and relevant frameworks in Section 4, the lessons learned on acquiring literacy in Section 2, and the relationship between proficiency and policy in Section 3, we would like to propose a definition and a general framework for energy proficiency for decentralised governance.

5.1 PROPOSED DEFINITION OF ENERGY PROFICIENCY

Based on the definitions from Section 4.1 and our context, a definition for energy proficiency could contain these elements: **energy proficiency is the degree to which local authority officials are fluent with the nature, role, and socio-political context of energy production systems in their nation and region, and can obtain, process, understand, evaluate and act on energy information to provide sustainable and efficient energy for their communities.**

5.2 FRAMEWORKS FOR ENERGY PROFICIENCY

Drawing from the review of frameworks in Section 4.2, our framework includes aspects of knowledge, skills, attitudes, behaviours, as well as actor networks, national energy systems and changing institutions. These frameworks are applied to two dominant types of local governance: the managerial and the governmental types.

In the associated working paper, "Decentralisation in Sub-Saharan Africa: prevalence, scope and challenges", Batchelor et al (2014) note that local authorities tend to operate as one of two different types: 1) the managerial type, where 'the primary purpose of local government is the efficient delivery of services', and 2) the governmental type, where 'service delivery is important, but there is a wider role for local government both as the mouthpiece of shared community interests of a locality and also in making policy choices in its name within the wider body politic' (Nickson, 2011). Using this typology we propose frameworks for energy proficiency for local authorities for both the managerial and governmental types in Tables 5-1 and 5-2.

Table 5-1 depicts a framework for the managerial type of governance, which includes decision making on the delivery of services. Local governance often has input into civic amenities, and can in the case of truly decentralised budgets, be responsible for commissioning the building of local infrastructure such as clinics or schools. Where this is the case, this creates an opportunity for clean energy investment. Service delivery at a health clinic is mostly dependent on quality of staff and the flow of consumables such as drugs. However, as we know from the energy literature, energy consumption can be a considerable expense, and where lighting and machines are fed by an expensive diesel generator, the fuel consumption can become a key part of the overall budget. When the fuel runs out due to budget overspend or lack of logistics, the overall service delivery of the health clinic declines significantly.

Similarly, managerial type governance is often responsible for providing services such as street lighting and waste disposal. In the case of street lighting, local authorities can end up spending a large proportion of their budget on their energy bill, and the simple use of low energy lighting can make significant differences. Municipal authorities also often organise the collection and disposal of waste. Waste is a particular opportunity to examine the use of a physical waste resource for production of energy, or to minimise the use of energy in its collection and disposal. Local governance that has fiscal control of budgets can play a key role in determining the energy ‘cleanliness’ of local infrastructure and service deliveries.

Attribute	Characteristic (developed/prioritised in consultation with stakeholders)
Knowledge	<ul style="list-style-type: none"> • Energy flows, systems, and sources • National energy provision environment • Sustainable and renewable energy • Units of measure for energy use • Impact of energy on development and economy • General trends and initiatives in decentralised energy • Basic scientific facts related to energy
Skills	<ul style="list-style-type: none"> • Assess the credibility of information about energy • Communicate about energy and energy use in meaningful ways • Make informed energy decisions based on an understanding of impacts and consequences • Obtain, evaluate, and utilise energy information from a variety of sources • Reframe energy concerns where necessary to go beyond centralised delivery.
Attitudes	<ul style="list-style-type: none"> • Awareness/concern with respect to global energy issues • Positive attitudes and values for sustainable energy • Assumption of personal responsibility for implementing sustainable energy
Actor networks	<ul style="list-style-type: none"> • Creation of space for dialogue within local authority • Creation of linkages to actors outside authority concerned with energy (locally and nationally) • Awareness of influences of ‘others’, and discernment of vested interests.
Changing institutions	<ul style="list-style-type: none"> • Awareness of resources available for ‘energy’ – within their institution, locally and nationally • Willingness to reassess resource allocation for energy concerns • Developing capacity within organisations to allow them to understand and respond to energy issues; • Influencing strategy within own and other organisations to allow them to understand and respond to energy issues.
Behaviour	<ul style="list-style-type: none"> • Communicates information about energy issues not only as a personal concern but also as a problem affecting the larger community; • Implements and evaluates effective policies and projects • Encourages others to implement effective policies • Shares information and learning

Table 5-1. Energy proficiency framework for the managerial type of local governance (efficient delivery of services)

Table 5-2 presents a framework for the managerial type of governance, characterised by ‘a wider role for local government both as the mouthpiece of shared community interests of a locality and also in making policy choices in its name within the wider body politic’ (Nickson, 2011). This is a different role for local authorities in the changing energy landscape. Here they might use their political convening power not to spend government funds on clean energy, but by strategic use of the planning processes, or by consultation, they might influence the use of clean energy within their locality.

For instance if a factory is about to be created, and the proposal suggests that it will use diesel generators or create an unused waste, the local authority might tie planning approval to such factory considering a cleaner energy source or a reuse of the waste. Similarly, local authorities have consultations and awareness raising activities for their constituency. The inclusion of a clean energy message and an encouragement to use clean energy can be embedded in the ongoing process of discussing shared community interests. We have seen this happen in the economies of the developed world, where ‘feed in tariffs’ have enabled a transition to renewable energy, and local authorities have undertaken awareness campaigns to encourage uptake of the nationally available tariffs. Most African countries are introducing feed in tariffs, and this might be an area of specific interest for local authorities, both in terms of shared community interests and in managerial type governance.

Attribute	Characteristic (developed/prioritised in consultation with stakeholders)
Knowledge	<ul style="list-style-type: none"> • Energy flows, systems, and sources both within their control and within their influence, and outside of their control and influence • Sustainable and renewable energy • Units of measure for energy use • Impact of individual and societal decision on energy development and use • Impact of energy on development and economy • General trends and initiatives in decentralised energy • Basic scientific facts related to energy
Skills	<ul style="list-style-type: none"> • Assess the credibility of information about energy • Communicate about energy and energy use in meaningful ways, both to peer colleagues and to wider citizens • Make informed energy decisions based on an understanding of impacts and consequences • Obtain, evaluate, and utilise energy information from a variety of sources • Identify energy aspects of personal and community concerns • Reframe energy concerns where necessary to go beyond centralised delivery.
Attitudes	<ul style="list-style-type: none"> • Awareness/concern with respect to global energy issues • Positive attitudes and values for sustainable energy • Assumption of personal responsibility for implementing sustainable energy • Civic orientation (concern that knowledge benefits all and is distributed equally)
Actor networks	<ul style="list-style-type: none"> • Creation of space for dialogue within local authority • Creation of linkages to actors outside authority concerned with energy (Locally and Nationally) • Creation of space for dialogue with citizens and citizen organisations • Awareness of influences of ‘others’, and discernment of vested interests.
Changing institutions	<ul style="list-style-type: none"> • Awareness of resources available for ‘energy’ – within their institution, locally and nationally • Willingness to reassess resource allocation for energy concerns • Developing capacity within organisations to allow them to understand and respond to energy issues; • Influencing strategy within own and other organisations to allow them to understand and respond to energy issues. • Influencing strategy for citizens to allow them to understand and respond to energy issues
Behaviour	<ul style="list-style-type: none"> • Communicates information about energy issues not only as a personal concern but also as a problem affecting the larger community; • Implements and evaluates effective policies and projects • Encourages others to implement effective policies • Shares information and learning

Table 5-2. Energy proficiency framework for the governmental type of local governance (represents community interests in policy choices locally and nationally)

6 CONCLUSIONS

We have seen that energy proficiency is a wide ranging subject that encompasses knowledge, skills, attitudes, behaviours, as well as actor networks, national energy systems and changing institutions. Like its cousin literacy, if it is not used and practiced it can become stale. In the early days it is difficult to learn, but with practice it becomes second nature of people to apply their own experience and assessments and to make informed judgements. Beyond the acquisition of basic knowledge and development of a specific literacy, energy proficiency connotes fluency with energy systems and the competence to apply these in a way that meets the energy needs of communities.

For local governments struggling with the capacity to manage budgets and take wise decisions over a range of service delivery options and wider policy and political pronouncements, it is a necessary capability. If local authorities have an increasing say in fiscal administration of services, as suggested by Batchelor et al (2014), then local authorities need the package of energy proficiency as described in managerial framework in Table 5-1. However local authorities also have responsibility for wider policy and political actions, where they likely wish to encourage the wiser use of sustainable energy among their constituencies, and to ensure that clean energy is finding a way into the local economy as described in Table 5-2. To do that they need to be aware of citizens requirements for energy proficiency and find mechanisms for strengthening its development as a key part of service delivery.

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ANNEX A: BARRIERS TO AND FACILITATORS OF THE USE OF EVIDENCE BY THEME

Barriers and Facilitators categorised into themes (n = number of studies)		
Seen as barrier	Factor	Seen as facilitator
85	Contact and collaboration	98
8	Collaboration	49
42	Timing/opportunity	24
8	Relationship with policymakers	39
8	Relationship with researchers/info staff	37
8	Contact with researchers/info staff	31
9	Contact with policymakers	30
2	Other	1
92	Organisation and resources	99
63	Availability and access to research/improved dissemination	65
25	Costs	11
3	Managerial support (practical)	22
11	Professional bodies	15
11	Material resources available	12
14	Staff or personnel resources	10
3	Managerial will	5
9	Staff turnover/continuity of employment	3
9	Other	9
85	Research and researcher characteristics	95
54	Clarity/relevance/reliability of research findings	46
18	Format of research findings	26
9	Importance of research findings	10
25	Other	32
62	Policymaker characteristics	69
26	Policymaker research skills	22
24	Policymaker research awareness	10
13	Political support (will)	21
4	Political support (practical)	12
12	Practitioner research skills	6
3	Practitioner research awareness	2
6	Other	11
28	Policy characteristics	33
6	Guidelines or policy statement	9
9	Importance of policy	11
5	Legal or legislative support	3
26	Other pressures on policy	5
4	Other	4
10	Other	1
9	Consumer-related barrier	0
1	Other	1
105	All factors (total)	124

ANNEX B: HOW ENERGY LITERACY IS APPLIED TO SPECIFIC CONTEXTS*

Source	Location	Context	Level of Analysis	How Assessed	Findings
DeWaters and Powers (2008)	U.S.A.	Academic: Young people in schools	Individual	knowledge, attitudes and behaviours (cognitive, affective and behavioural)	low levels of energy-related knowledge; attitude and behavior scores slightly better. They lack the knowledge and capabilities to effectively contribute toward a solution.
Dwyer (2011)	U.S.A.	Academic: young people in schools	Individual	Relationship between energy literacy (knowledge) and attitudes toward Environmentally Responsible Behaviour (ERB)	Attitudes toward ERB are impacted negatively if energy literacy uses negative motivation on environmental disasters; positively if they are pragmatic and benefit-based
Turcotte et al (2012)	Canada	Public opinion; consumer	Individual and consumer aggregates	ranking and importance of energy compared to other national issues, preference for various fuel types and willingness to pay for offsetting environmental impacts from energy generation.	good general knowledge of energy use and relative cost but lack detailed knowledge about sources of energy fuels, as well as sources and linkages with environmental impacts. However, an overwhelming majority of respondents indicated they were concerned about environmental issues
Brounen et al (2013)	The Netherlands	Residential households	Individual	Awareness of their energy consumption and whether they have taken measures to reduce their energy costs.	56% of the respondents are aware of their monthly charges for energy consumption, and 40% do not appropriately evaluate investment decisions in energy efficient equipment
Stephenson et al (2010)*	New Zealand	Consumers	Individual behaviour	Framework of energy 'behaviour': interactions between cognitive norms, energy practices and material culture	Framework applied to creation of rural energy project for 200 households called the Waitati Energy Project (WEP).
Garg and Kandpall (1998)*	India	Academic and vocational training	Individual	Proposes a curriculum for renewable energy education for schools, universities and technical training	No study conducted
Lee (2011)	Taiwan	Academic: secondary school students	Individual	Used Nominal Group Technique (NGT) to create a definition of energy literacy for a group of students	-Conservation more important than development -NGT Method worked well in Taiwan for developing curriculum
Achor (2012)*	Nigeria	Academic: university students	Individual	Awareness of energy crisis and the causes of this crisis	Low awareness of energy crisis; corruption and illiteracy cited as causes, but poor maintenance and waste not mentioned
UN (2011)*	Botswana	National and local	National sustainable	Assessment of energy challenges, makes	Integration of energy sources and projects most needed. Education,

		policy-makers	energy challenges	assumptions about low knowledge of policy-makers	training, entrepreneurial capacity, sectoral programmes (agriculture, water, transport, tourism, etc) need to coordinate in setting the agenda for sustainable energy services.
World Bank (2010)*	Cambodia	150 Licensed Renewable Electricity Enterprises	Training curriculum for local grid enterprises	Skills: technical, safety and business management	Not reported in this document, although this was part of a project in a number of countries.
Mohan (2007), World Bank Project*	Ethiopia	Policy-makers; energy technicians	National policy-makers; national energy company (EEPCo)	improve the utilization efficiency of rural renewable energy	-Decentralization of EEPCo's operation and management structure -Reports with policy recommendations and strategies aimed at enhancing rural biomass energy supply and the efficient use of biomass fuels.
Republic of South Africa (2012)*	South Africa	Public opinion	Individual; aggregated results	National survey on energy-related behaviours and attitudes towards energy use and availability. -Assessment of energy poverty	-the increased likelihood of being energy poor if a household has a lower living standard level or falls in the poorest per capita income quintiles -the greater incidence of energy poverty among households located in the Eastern Cape, Limpopo, Mpumalanga or in rural traditional authority areas.

**Studies with a * do not mention the term energy literacy but incorporate elements of its meaning.*