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Title: Success in International Decentralised Urban Energy Initiatives: a Matter of Understanding?

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Abstract

Many towns and cities worldwide have begun implementing decentralised urban energy systems. Aiming to reduce their carbon emissions, many utilise not only technological innovation but also innovative policy, financial and social-economic approaches.

Following interviews with stakeholders, four international cases, all of which were defined by stakeholders in different ways as ‘successful’, provide insights into the instigating driving forces contributing to success.

Understanding of ‘success’ varied between projects and between stakeholders, depending significantly on individual attitudes to sustainability, financial feasibility, technical performance and social acceptance, suggesting that a realistic definition of success involves not just a project’s financial feasibility and energy savings, but that enhancing high-potential partnerships and transparency, and acceptance and understanding of the proposed project are also critical, as are interest from the media and outside organisations. The success of a project therefore cannot be measured simply via its outcomes – process factors and the context in which they unfold are also crucial.

Keywords: success; decentralised energy; case studies

1. Introduction

Energy efficiency and the shift to more sustainable energy sources are expected to be more prominent in the future due to the intention of national and local governments, communities and individuals to reduce their carbon emissions, as well as to achieve financial savings. Widening the use of decentralised energy (DE) systems can contribute to these aims (Coaffe, 2008; Turcu et al., 2011). DE systems have been successfully implemented in many towns and cities worldwide, demonstrating that they can help lead to enhanced carbon emission reductions. Examples include the development of systems based not only on technological innovation, but also on innovative policy, financial and social-economic approaches. Similar projects however, can be successful in some cases but fail in others, as project success is a complex notion including a set of individual factors that, when intertwined, lead to a particular set of outcomes.

The Oxford English Dictionary (2010) defines success as “*the accomplishment of an aim or purpose*”; this definition is a typical understanding of the term within DE projects. Our deeper examination has found, however, that while reaching targets is, undoubtedly, a crucial factor in how success is obtained by those implementing projects, the criteria for success are much wider: it reflects varying (and sometimes differing) views of the relevant stakeholders and, in addition, may fluctuate from project to project.

Many definitions of success come from management and business or construction studies, where the main criteria for success are often suggested to be time, cost, user satisfaction, and specific measurable quality levels. However, our research points to

broader conceptualisations of success that goes beyond commonly measured factors. For example, in some cases, projects are believed to be successful even though they have not met the intended timescale and budget. Historical examples from construction and infrastructure are widespread, encompassing such famous examples such as the Anglo-French Channel Tunnel, Australia's Sydney Opera House and more recently, the UK's Wembley stadium, all of which were delivered late and vastly over budget. These key delivery parameters however, are often tempered with time, to be replaced with a more positive (though some may say blinkered) perspective, based more upon prominence, recognition and capability, rather than value for money

Current literature on DE projects (e.g. Wiersma and Devine-Right, 2012) mainly focuses on the description of successful projects, and there is an opportunity to further explore definitions and conceptualisations of success. This paper helps addressing this deficiency by providing empirical evidence regarding the success factors of four international innovative DE projects, claimed successful by academics, the press and the implementing stakeholders themselves. The objective of the paper is therefore to identify and discuss such 'non-typical' factors, and to understand how these can affect and define the level of success attributed to a project.

2. Methodology

This research was conducted as part of the Challenging Lock-in through Urban Energy¹ (CLUES) project. As part of this, a database of DE initiatives was created, from which the international and UK-based case studies were chosen (Turcu and Rydin, 2012). Further details on the UK DE case studies and the Delphi study, also carried out as part

¹ www.ucl.ac.uk/clues

of the CLUES project and referred to in this paper, can be found elsewhere (Devine-Wright and Wiersma, 2012; Sherriff, 2012).

A case study approach has been chosen, as it is the most appropriate research method when questions *whether* and *how* are asked (Yin, 1994); it focuses on understanding the dynamics present within single settings (Eisenhardt, 1989) and allows researchers “*not to generalise in order to formulate a scientific law, but to generalise to theoretical propositions*” (Yin, 1994). Strength of case study analysis is its ability to deal with a full range of evidence (Yin, 1994) and to present a “*comprehensive research design, with a multi-disciplinary character and a large number of factors to be considered*” (de Weerd-Nederhof, 2001).

The case studies were chosen from an initial set of 35 identified through a desk survey of recent DE projects internationally, the main selection criteria being:

- Applicability and uniqueness of the project: i.e. the project/ approach has not yet been applied in the UK or has only been applied on a very small scale, but could potentially be applied on a larger scale;
- Usefulness for investigation of various aspects of the project: e.g. the way that governance stakeholders interact, consumer engagement with technology and how these influence the project implementation and outcomes;
- A range of different scales, locations, cultures and technologies;
- Financial affordability for investigation and case study development.

Extensive desk research was conducted initially to identify media articles, reports, websites and newsletters in order to develop background knowledge and to help

develop the interview questions. Personal site visits to the project locations were then arranged to help obtain additional information and insights.

For each case study, three or four semi-structured interviews (15 interviews in total) were then conducted in person or via video conferencing with a variety of project stakeholders, covering the governance, finance, technology, and social aspects of the project, and the potential for replicability. The aim of the interviews was to gain first-hand information regarding the decision-making processes and the implementation of the project, as well as the role of the stakeholders in the project and how it evolved over time.

After coding and analysis of the initial interviews, an additional five secondary interviews were conducted to clarify and further investigate key drivers, barriers and other issues identified in the initial analysis.

The interviews were audio reordered, transcribed, and thematically analysed and coded using Nvivo 8. In reporting material from the interviews, participant anonymity is preserved: only case study names are mentioned when the quotes are used.

3. International Case Studies

The four case studies investigated presented a range of locations, technologies and scales (Table 1) and all were thought of as successful by the stakeholders involved. Coverage in academic and policy literature and the wider media has portrayed them in a positive light. However, the factors that are considered to define the success, or otherwise, of these projects differs depending on who gives the definition, as will be discussed further in this brief outline of each of the case studies. While it is clear that failure is a good learning tool (e.g. Cope, 2011; Love et al., 2011), there were no

‘unsuccessful’ case studies chosen for this research; this was done intentionally, as the original aim of researching into international case studies was to find the best practice innovative examples that have not yet been attempted in the UK, but have a potential to be implemented. In addition, if carbon reduction targets are to be achieved we need to nurture the successful projects and learn from them.

Table 1 Overview of international case studies (adopted from Chmutina and Goodier, 2012)

	Seawater district heating	Morris Model	Energy Saving Partnership	Kungsbrohuset office building
Location	The Hague, Netherlands	Morris County, New Jersey, USA	Berlin, Germany	Stockholm, Sweden
Technology/ area	Seawater heating	PV	Building retrofit (control systems, behaviour)	Eco-smart building (several technologies)
Scale	750 houses	19 municipal buildings; 3.2 MW	1,400 buildings	1 office building, 27,000m ²
Instigating party	Vestia (housing corporation)	Morris County Improvement Authority (MCIA)	Berlin Energy Agency (BEA)	Jernhusen (developer)
Energy / CO₂ reduction	50% CO ₂ reduction annually	51,500 MWh over 15 years	60,400 tonnes CO ₂ /year	50% less annual energy consumption
Initial project aim	Sustainability	Financial savings for the local government		Profitability

Having outlined our methodology, the four case studies will be introduced in the next section and i the ways in which stakeholders conceptualise success in relation to them will be indicated.

3.1 Seawater Heating System, Duindorp/ Scheveningen, The Hague, Netherlands

The City of The Hague developed an innovative district heating system consisting of a seawater central supply unit with a heat exchanger and heat pump unit that uses the

nearby sea as a source of heating and cooling. The Hague and Vestia Housing Corporation partnered with the engineering consultancy Deerns to implement this energy source as part of the reconstruction of 800 highly energy efficient houses in Duindorp (The City of The Hague, 2009).

This unique system is more than 50% more energy efficient than conventional high-efficiency boilers, and whilst the cost to the residents is the same, it achieves a 50% reduction in annual CO₂ emissions (Goodier et al., 2012).

The stakeholders involved identified a number of outcomes that they felt represented success for their project. Most tangibly, they mentioned a reduction in CO₂ emissions, compared to the previous gas central heating. Alongside this, less quantifiable measures of success were the extent to which those involved had learned about process, and the potential for the project to educate others such as local residents and any other interested parties. In particular, the project helped make the area more sustainable, an overarching aim referred to locally as ‘Sustainable Duindorp’:

For the energy saving it is a success and also for CO₂ reduction it's a success and to learn about it for a lot of people is a success, yeah.

Factors that contributed to these successes were the level of commitment to sustainability of Vestia Housing Corporation and The City of The Hague, and the willingness and interest of other partners to be involved in an innovative and challenging project. Success for this project can be understood as both process and outcome: the process factors being those that enable the outcome to be achieved.

3.2 Berlin Energy Saving Partnership (BESP), Germany

The BESP was first introduced by the State of Berlin in 1995. The concept was based on transferring energy management of state-owned properties to a partner, who used private capital to self-finance the modernization of building infrastructure necessary to cut energy use and CO₂ emissions. In return, the partner guarantees annual energy cost savings for the state (Chmutina et al., 2012; BEA, 2008). Energy efficiency measures included refurbishment of heating and lighting, energy management, and motivational measures. The model is now widely replicated in other European countries such as Slovenia and Romania, as well as in China, Chile and other countries (Chmutina et al., 2012).

The Berlin Energy Agency (BEA) played an important role in its success, ensuring careful planning and development of the project. They identified indicators of success as the level of interest and custom from business and the fact that they have been able to expand the model and offer their experience elsewhere:

It's very successful I think for us... Well, we are doing three or four tenders maybe a year now which is nice to have, we have a lot of things. For example, we're doing guidelines and studies and what is very successful is that we've transferred this model to other cities and even to other countries.

The success of this project is attributed to the support of the local government as well as the ability of local energy saving companies (ESCOs) to see energy savings as a good business opportunity.

3.3 Morris Model, New Jersey, USA

The Morris Model is a unique and cost-effective method of financing municipal DE projects through low-interest bonds, traditional Power Purchase Agreements (PPAs) and

federal tax. It allows local governments to receive access to renewable energy at a price lower than they currently do, without any debt obligation. The Local Financial Board approved the Morris County Improvement Authority (MCIA) bonds of up to \$30 million and the MCIA issued \$21.6 million of debt at a 4.46% net interest cost with a county guarantee to fund 19 solar projects (Chegwidden et al., 2010).

Traditionally, local governments have two ways of financing solar programmes: either with tax-exempt bonds (local government-owned approach), or by entering into turnkey relationships with private solar developers. The Morris Model is a hybrid that takes advantages of both options, whilst minimizing drawbacks. It uses a turnkey approach, with the difference that the financing being provided at the lower cost of capital is obtained by government. This allows cheaper financing as well as preserving the capacity of the utility to borrow from the private capital lending sources for other projects (Pearlman and Scerbo, 2010).

The MCIA has completed the first phase, installing 13,629 solar panels in 5 school districts and several county government facilities providing the county with 3.2 MW in clean energy and around \$3.8 m in annual savings (Chegwidden et al., 2010). The Morris Model has been replicated in the Somerset and Union counties in New Jersey, with several other counties in various stages of review.

The Morris Model was felt by participants to be a success because of the financial savings it brought to the local government and end users, the broader interest it received from other counties and states, and its potential for replication:

It has been successful because it's lowered the cost for everyone and the savings have been passed on to the towns and the schools. As long as these deals continue and don't default I would say they're going to expand.

The success of the project was attributed to strong leadership and their innovative ideas, as well as to the support from the local government.

3.4 Kungsbrohuset Office Building, Stockholm, Sweden

Kungsbrohuset is a 27,000 m² 13-storey property next to Stockholm central train station containing offices, shops, restaurants and a hotel. The owner – Jernhusen - wanted to build a sustainable office building using readily available materials and technologies in order to create a development where the environment and energy-efficiency were central considerations, and the office space is now primarily let to companies that want to boost their environmental image (Jernhusen, 2012). All the tenants are supported by an in-house expert who helps them to minimize their impact on the environment. The building is advertised as being eco-friendly (Jernhusen, 2012):

- An Eco-smart building: energy efficient façade and environmentally efficient materials, combined with other innovative solutions that lead to three environmental certifications (GreenBuilding, P-Mark, Eco-classed Building).
- Eco-everyday: services and technical solutions that enable users to operate in an eco-friendly way (e.g. automated room temperature and lighting controls).
- Eco-location: the building's proximity to public transport makes travelling easier, combined with additional services provided such as a cycle scheme.

Stakeholders identified several indicators of success, from financial to reputational:

We earn the amount of money that we want to. We have reached the energy levels that we aimed for. We have more media attention than we wanted. We've filled the house with tenants. So yeah, I'd say it's successful. We did what we planned to do.

They attribute the success and popularity of the building to a number of factors, including access to finance by the building owners, managing the risks with a good market understanding, active involvement in the construction and operation process, and the precise matching of new technologies and products with tenant requirements.

4. Factors of Success in Energy Initiatives

The following section discusses how success can be understood through the lens of the four case studies, starting with an overview of the ways in which success is understood in the literature.

4.1 Defining Success

There is systematic research into investigating the critical success factors of DE initiatives, and the main research carried out into success factors is in the areas of business studies (e.g. Trkman, 2010; Turner, 1993), IT (e.g. Wateridge, 1998) and construction management studies (e.g. Xu et al, 2011; Chan and Yu, 2005; Brohmann et al., 2008).

According to Xu et al. (2011), the crucial success factors can be divided into five factors: external, project related, team, contracting, and project management. Brohmann et al. (2008, p.3) state that: *“A successful project is one that has managed to coordinate the various interests of the actors related to the project at the end point of the project. It refers to the techno-economic outcomes of the project as defined by the project*

managers. A fully successful outcome thus provides the designated features and functions, largely within the timescale and budget originally planned”.

Alagappan et al. (2011) suggest that the main success factor for a DE project is financial in the form of a competitive return on investment commensurate with its business risks, with a financially successful DE project normally possessing physical enablers; consumer interest; guaranteed availability of finance; and availability of a ‘renewable – friendly’ tariff, i.e. FiT (Feed-in-Tariff).

Sherriff (2012) has conducted a Delphi study in order to identify measures of success amongst UK stakeholders involved in DE projects. Respondents were asked to select, from a closed list, terms that best described the way that they would measure success in their DE scheme. Carbon emissions reduction and social and economic regeneration metrics were the most prominent across the sectors as a whole. There are some notable differences between the sectors. The private sector reflected a range of measures of success, rather than being dominated by one or two, whereas the respondents in other sectors tended to highlight one or two measures of success above others. Reputation was not given strong emphasis, although around a third of public sector respondents did mention this. Professional third sector respondents were most likely to see customer satisfaction as a measure of success, whereas it was the voluntary third sector respondents who gave most value to income, perhaps reflecting the tendency of voluntary sector groups to see DE as a way of raising revenue.

The understanding of success indicated in this UK Delphi study is arguably more ‘conventional’ in a sense that it mainly covers tangible and quantifiable factors of success that can be attributed to the outcomes rather than the process. However,

Wiersma and Devine-Wright (2012) argue that, while carbon emissions reduction play an important role in measuring success, a much wider range of factors has to be taken into account when judging whether the project is successful or not, such as replication of the project, or proving that something can be done without support of the policies.

In addition, and perhaps reflecting the nascent nature of DE and the tendency for practitioners to see themselves as trailblazers for something that should be rolled out, rather than guardians of a niche technology, for the project to be seen as successful, other crucial attributes were mentioned. These included seeing an interest in project replication from non-involved parties, improvement in the reputation of partnerships and stakeholders, support from local government, and a process of learning.

These examples indicate that, in the opinion of the stakeholders, the notion of success cannot be clearly defined without looking at both processes that lead to the success and the outcomes that measure or quantify the success; stakeholders mentioned not only the way they would measure success (e.g. CO₂ emissions saved, profits made, number of replication projects), but also how that success was achieved (e.g. the commitment to sustainability of partners, careful planning and development, and the effective management of risk). The outcome factors thus reflect the aims of the project and although they are crucial for the evaluation of success, they do not play a role in achieving the success. On the other hand, the process factors are in a sense 'internal' to the project implementation and can be modified and adjusted in order to influence the outcome of the project. As deliberated below, this indicates a level of recognition that it is not only the end that is important, but also the means: success is not measured purely by what is achieved, but also by how it is achieved. In turn, these process factors help to shape the outcome.

The success factors acknowledged in each of the case studies are shown in Table 2.

Table 2 Factors of success

Case study/ factor	The Hague	BESP	Morris Model	Kungsbrohuset
Financial profitability		x	x	x
Emissions reduction/ energy savings	x	x	x	
Improvement in reputation	x	x		x
Interest in replication/ attention	x	x	x	x
Learning experience	x	x	x	x
Previous partnerships	x	x	x	x
Support of local governments	x	x	x	

This paper does not explore in detail financial profitability, energy generation or emissions reduction as measures of success. Rather, the focus is the less conventional factors of success that were mentioned by interviewees, which we explore in the remainder of this section. This is not to discount those more conventional measures of success, but to draw the reader's attention to the wide range of other measures of success that should be borne in mind when evaluating the contribution of DE initiatives.

4.2 Partnerships

The notion of partnership working, and the importance placed upon it, is not new. In order to have changes in sustainable development, technical, organisational and institutional adjustments need to take place, and this requires collaboration of different actors (Hartman et al., 1999; Malmberg, 2006). This collaboration – or partnership – promotes the potential for learning and development needed for innovation and sustainable transformation (Malmberg, 2006). Foxon et al. (2005) support this argument in that partnerships provide competitive advantage and play an important role in a projects' success.

As our case studies indicated, many of the partners had already worked together (Figure 2).

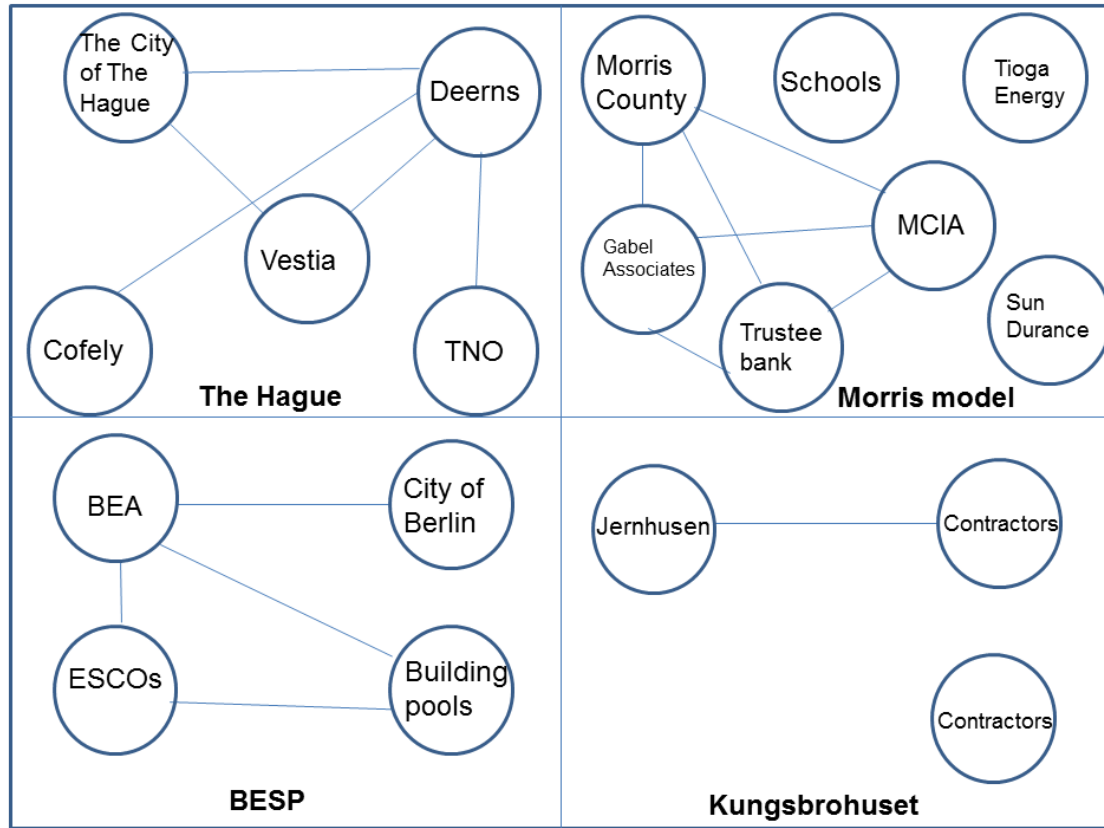


Figure 1 Graphical representation of previous and/or established partnerships in the 4 international cases

Interviewees suggested that building on previous partnerships fostered confidence that they would be successful, as the partners are already know that they are bound by the clear vision of sustainability. Previous partnerships are also beneficial as they have also developed effective coordination and trust (Xu et al., 2011), ‘trust’ meaning a belief that a party can reliably fulfil its obligations in an exchange relationship (Chen and Chen, 2007):

We took some of the consultants that we had worked with before and that we trusted (Kungsbrohuset).

In addition, previous partnerships help to assure the commitment of the parties as well as the execution of the project in a timely and efficient manner as partners know what to expect from each other.

For example, in The Hague, all the main stakeholders had worked previously together on a geothermal heating project and were interested in taking their partnership further as they shared similar values and beliefs when it came to project implementation:

Vestia was one of the more innovative housing corporations, so it's better to work with them than with the more poor housing corporations, it's always the balance between idealism, [practicalities] and money... They [main stakeholders] believed in this project and the strength and the quality of the co-operation was champion.

They were also encouraged by the challenge:

It took a long time, but in the end it was successful. I mean we started something that was completely new and, you know, I've seen other different projects which if the parties are not completely committed to finish it and during the process somebody quits, then everything plummets down and it's over. And that can be very frustrating because you just need examples to show that it can be happening and it can be successful and it also works.

BESP also preferred working with existing partners as it saved time:

It's very easy because everybody knows about the procedure and because they've had success in the past contract. This is very good for us as an approach because it's much easier to develop these projects than to convince everybody to give a lot of information and then deal with all the concerns.

As partnerships form and reform, they can create a shift in project aims and it is useful to invite new partners in order to have diversity and a fresh view on the established

ways of working. New partnerships can lead to negotiations, which potentially can give a push to new ideas and develop innovative ways of finding the solution.

As partnerships develop, they can attract stakeholders who would not necessarily be involved in such projects. Just as partnerships can evolve, so can projects fuse partnerships. For example, in the Morris Model, this was an outcome:

I think it's a success because I think it represents a fantastic partnership between a County Agency [MCIA] and local school districts that might not have happened without someone creating an idea and putting it out there as a pilot programme.

As such partnerships develop, this outcome becomes part of a process that creates conditions for further projects to flourish:

It enabled me to kind of see outside of my own district and I don't see that happening in other counties in our State. So I think it's a nice, seamless relationship between two different levels of government and education and how they can work together to create a model that benefits not only the educational process but also the financial conditions of a town.

Partnership working, then, can be seen as both a process factor (an approach that helps to make a project successful) and as an outcome factor (a result of the project, and a reason for supposing it is successful).

4.3 Support of the Local Government

Like partnerships, the support of local government can be seen as both a process factor and an outcome factor, as they reflect the aim as well as the internal process of the success achievement.

Involvement of local authorities benefits DE initiatives as local authorities often have previous experience in trying to develop and promote suitability in the communities and in securing funding from national government. They can also facilitate and develop small-scale projects to demonstrate the costs and benefits of DE and have considerable knowledge regarding local resources, supply management, regulations etc. as well access to locations for putting into practice the policies and agreements signed on a higher level (Khare et al, 2011). Another benefit of involving local authorities is that they are not only interested in economic opportunities, as businesses could be expected to be, but also in local governance, community and environment (Michalena and Hills, 2012).

Both the Morris Model and the BESP are private-public partnerships and could not be carried out without the involvement of local authorities. However, instead of playing their role only as financial guarantors, the local authorities in both cases took an active role in promoting the projects and winning the backing of the local government, which can be viewed as an aspect of success, an outcome:

We are very close to the city of Berlin, there was a strong back-up in parliament and also from other institutions too. And they were also really active to develop the model contract and so on and there was in these times a lot of strong, political back[ing].

The Morris Model benefited from the sustainable commitment of the Morris County as well as their financial stability:

They were committed to seeing this through right or wrong. They also are a wealthy county so they see the value of long-term investment. This county was the right county in that it was uniform and that it had the wherewithal to see it for the long-term. It was important to have the right political team backing this project all the way through otherwise it would not

have happened. It just flat out would not have happened and would not have had the support.

Like the Berlin case, the Morris Model proponents needed the support of their local government to be able to run a successful project, but first needed to convince them of its value. This early outcome, then, can be thought of as part of a larger process.

In the case of The Hague, the local government was interested in being involved with the project. They could not financially afford this type of project but had the idea of making The Hague sustainable:

It was the only chance we had [for] renovation [and] restructuring [of the] area to [make it] carbon neutral. That was inspiring because now we have the chance; otherwise we have to come back [in] 50 years. So it's now or never.

Having local authority as a part of the team helped Vestia to ensure that the old harbour can be used for the heating system plant.

4.4 Learning Experience

The capacity to learn from project experiences is both a process and an outcome factor: it is important to be able to build learning into the project as it develops, and to learn from previous and parallel work, but it can also, stakeholders suggested, be a sign of success that the project can improve the overall knowledge level on the implementation of DE: *“to learn about it for a lot of people is a success”* (The Hague).

Learning is a key component that drives the process of technology change (Kiss and Neij, 2011). Several types of learning have been identified that promote changes in the socio-technical innovation system: learning-by-searching, learning-by-doing, learning-by-using, and learning-by-interacting. The implementation of the case studies presents a

mix of these experiences, as the stakeholders learnt through various perspectives. With all the projects being innovative and with the stakeholders not having direct experience of the specific activities, the learning experience was identified as a factor of success:

It's a learning project, so we have to deal with also the negative points because those lessons are the most important I think. If you solve a problem it's a new stepping stone to success (The Hague).

This quote illustrates the prominent role learning can have in a project, and the way this learning can inform and shape that project and future projects: a 'stepping stone' to success in other, perhaps more conventional senses.

Learning processes allowed the involved parties to find better ways of implementing similar projects in the future and to decrease the time and the amount of money needed for the first projects' implementation:

The first deal took us 18 months to implement and yet today a deal can go from the beginning to the end in 6 months and I think that's an advent of the process having worked and the fact that when I go to a county and towns and schools now I can say "Look at this project over here. Whatever questions you have you don't have to listen to me, a lawyer. Go call your counterparts at the county or at the schools and towns and hear from them," and that has eliminated a significant amount of the education gap (Morris Model).

This further illustrates the potential for learning to be an outcome that in turn feeds into subsequent processes, making them more effective – in this case helping them meet more challenging timescales.

Stakeholders admitted that there were many errors in the first phases of the project that can now easily be avoided:

We have done a lot of mistakes at the beginning, but if you look at the contracts from the beginning or the procedures, there's a lot of trial and error. So today if there's a problem in a clause or any kind of thing with the contract or with the implementation, usually we have the answer because we have seen this in another programme and we just take out some documents and say "Okay, you can solve it like this. Take this protocol," and so on. We really gained a lot from it (BESP).

Avoiding the mistakes is seen as a part of a learning curve and now allows the stakeholders to replicate their projects as well as to share the knowledge with other interested parties.

4.5 Interest from the Parties not Involved in the Project Implementation

In each of the four cases, there was initially no intention to replicate them. However, once the projects were implemented and the first successful results were achieved, the stakeholders received significant attention from other industry professionals:

There is quite a lot of interest in the system and actually I think everybody is waiting till we make a publication about the system showing that it works alright (The Hague).

This illustrates the ways in which a potential ancillary role of projects, such as building the trust and confidence of other stakeholders, and come to the fore. Media and research institutions were also interested in learning about these projects:

I'll show you a list of media interest... well not only media, but interest in our company and the product. This is a couple of radio stations there and then there's a couple of magazines. A couple of TV stations, a couple of radio and internet. Right now we encourage visits especially from university schools, students and researchers (Kungsbrohuset).

In the case of Morris Model, many local authorities of other New Jersey Counties showed the willingness to replicate the model:

There are 9 counties of I think 22 in New Jersey that are at some stage of doing or having done a deal. Somerset has actually completed 2 deals since then.

In some cases without acknowledging that Morris Model was the original initiative:

It's a success because any time somebody wants to copy your model you know you must be doing something right, and we've had other counties... It's funny because some of them don't even give us the credit. So that in itself I think makes us successful because you're not going to do something unless it's proven.

The tendency for others to copy the project, whether attributing it to them or not, was seen by the original initiators to be an aspect of success.

The interest arises not only from local governments and companies but also from the community:

There are a lot of members in the community that have asked us questions about it in terms of how easy is it to install, how much does it cost and different things like that (Morris Model).

The visibility of the projects therefore raised the awareness and acted as a driver that stimulates communities to use similar technologies. An outcome stimulates a process, which in turn has the potential to lead to further beneficial outputs.

The project stakeholders disseminated their initiatives nationally and world-wide in order to share the learning experience and outcomes of the project:

I'm being asked to speak about this nationally. I've spoken at about 3 or 4 national conferences where people ask me "Can this be taken to other states?" (Morris Model).

Some of the projects became famous outside their countries and have now been replicated abroad, and this is recognised as a form of success:

We're doing guidelines and studies and what is very successful is that we've transferred this model to other cities and even to other countries (BESP).

This leads to a next factor of success - improvement of the reputation, particularly beyond the environment where the project was implemented.

4.6 Improvement of the Reputation

Reputation is defined as a subjective collective assessment of the trustworthiness and reliability of companies (Fombrun and Van Riel, 1997), and is related to image, esteem, prestige and goodwill.

Most of the stakeholders claimed to already have a good reputation in their areas and the improvement of the companies' reputation in terms of their contribution to sustainability was not the aim of the project. In fact, their good reputation was arguably a process factor that enabled them to build on partnerships and access resources:

I think we got about 20% more per square metre and a lot of that is to do with the environmental performance and the reputation that this building has (Kungsbrohuset).

However, by attracting media and government interest the profile of the main stakeholders was raised as these projects showed how the carbon reduction and financial savings can be achieved. For example, Jernhusen is now seen as a 'green' company whereas before the Kungsbrohuset office building was constructed, their company did not have a 'green' image and was simply a property developer:

This worked for our employer branding because not only do people who do not work here but work in politics or in municipalities and so on think of us as a good company, but the people who work in this company can look at this building with pride and feel that they

work for a company that is good and that does good things and that installs morale and so on.

Now the 'green' reputation has become part of their marketing strategy and they are able to charge higher rent fees because their buildings are user- and environmentally-friendly.

BEA has also received further business opportunities due to the reputation of the BESP:

We [BEA] create further projects or further business out of this basic model.

The enhanced reputation, then, is not only an aspect of success in itself, but is also a process factor in helping to secure other elements of success, such as increasing profits.

Local governments are also interested in improving their reputation and image. In 1999 The Hague seawater heating system project was awarded a Climate Star for the Best Innovation. This allowed the City of The Hague to claim that their sustainability strategies are not theoretical: they actually act towards making The Hague carbon neutral. In addition, companies involved in the project implementation have also received green credentials:

For politicians it gives possibilities for political publicity for our local government but also for the national government because the Minister of the Environment was the main opener of the project. And another point was in the line of research and development and engineering. Deerns won an innovative prize. So with publicity in professional journals or technical journals it was a very good point of PR for those engineers.

The City of Berlin is seen as an instigator and supporter of sustainable and financially feasible projects after the BESP was widely replicated:

The Energy Saving Partnership is often shown as a best practice example also from the City of Berlin.

Such outcomes therefore can help to build momentum in the broader process of developing sustainable cities.

6. Discussion and Conclusions

The objectives of this paper were to investigate the variety of often interconnected factors that can assist in understanding what success means in the context of DE projects.

When discussing success, case study stakeholders mentioned both achieving the aim(s) and the ways in which the aim(s) was/were achieved, conceptualised here as outcome factors and process factors. Although the outcome factors (such as carbon emission reductions or energy savings) are seen as aspects of success in a more conventional sense, process factors are also important, and can influence the success of the project either directly or indirectly. Moreover, they are often entwined and difficult to separate when discussed with regards to their impacts on a project's success, as illustrated in Figure 2.

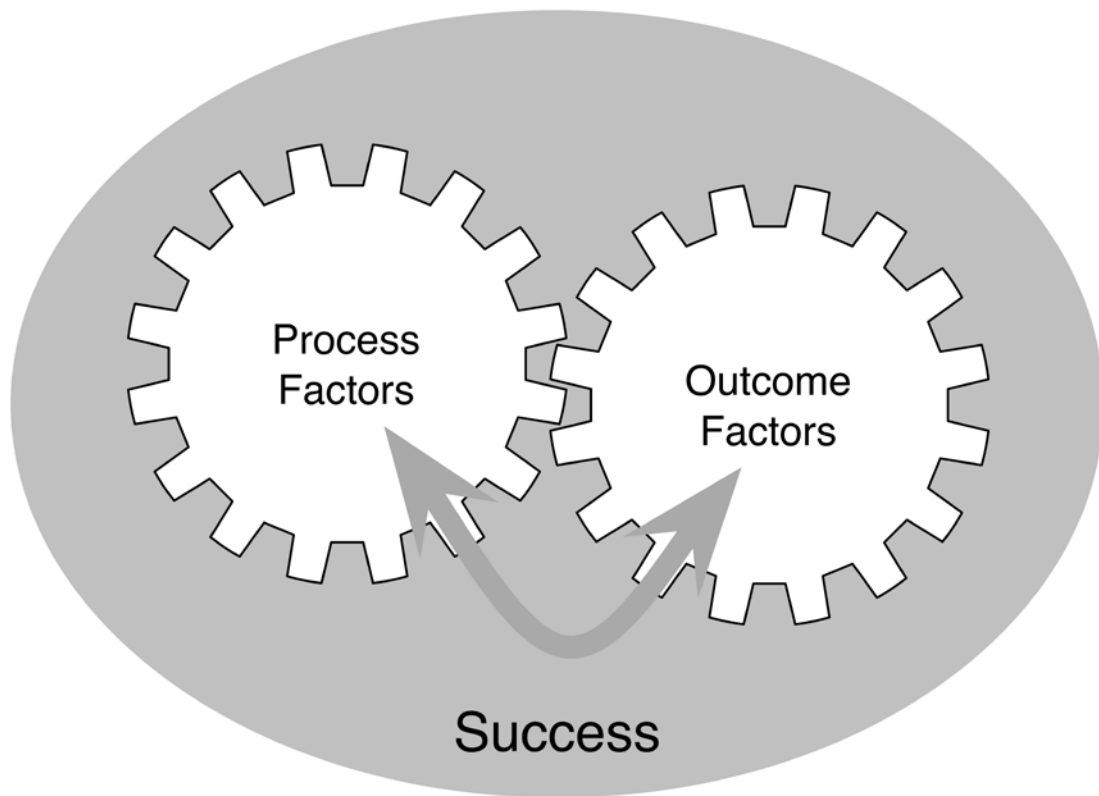


Figure 2 Graphical representation of inter-changeability and cross-influences between process and outcomes factors in the definition of success

For example, a process factor such as ‘involvement of the local government’ facilitates the removal or minimising of a social barrier, as end-users tend to trust (*outcome factor*) local authorities when it comes to energy efficiency advice. At the same time, the local government benefits from the involvement in innovative initiatives (*process*) not only from a financial point of view (*outcome*), but also from improving their profile and reputation (*outcome*) in reaching climate change targets and promoting sustainability (*process*). This suggests that what is understood as an outcome factor in one project could be considered in another context as a process factor.

The case studies suggest that although conventionally outcome factors are expected to be tangible and quantifiable, and ideally measurable and comparable, it is not always necessarily the case. Factors such as attention from stakeholders, reputation and

learning can also be aspects of success and is considered by some to be as important as carbon reductions and financial profitability.

Process factors can also be seen as outcome factors, if they are understood as a valuable capital of new experiences, partnerships and other resources that have been established throughout the project implementation and can consequently help to influence, and make possible, a new project. For example, with the Morris Model, schools partnered with the MCIA later described their experience to other schools in the county, stating that the project was successful due to this particular partnership as it opened 'new horizons' in terms of opportunities that the school did not know existed. Such new horizons can lead to new project opportunities: with the Morris Model, the project originally aimed at reducing energy costs for the local authorities and turned out to be a new and engaging educational programme incorporated into the school curriculum. Consequently, all the schools which participated in the project now also deliver sustainability classes to educate staff and nearby communities regarding the benefits of the PV. This was done using mobile education kiosks displaying real-time energy generation by the PV; the data which is then translated into easily comprehensible equivalents of energy consumption, such as cars and trees.

Process and outcomes therefore collapse over time: over a sufficiently long timescale the outcomes of individual projects become parts of a wider process contributing toward higher goals or targets. With DE, initiatives can build up an evidence base, capture lessons learnt, and establish the case for complementary and follow-on work. Over time, these outcomes become less important in isolation, secondary to longer term carbon reduction and energy security. In their own projects these may have been outcomes, but taken collectively as a wider programme of DE development they are part of a longer

on-going, continuous process. Even if an individual project is perceived to be unsuccessful at its time of implementation, it may later be seen to have contributed significantly to the development of DE more generally. The dilemma is that although success can be unconventional, it is often the more conventional aspects of success that draw attention to a project, in turn helping to make possible some of the less conventional aspects of success such as reputational enhancements, partnership working and peer learning.

It appears that the success of a project is often in the eye of the beholder (or stakeholder). Undoubtedly, stakeholders are usually biased to the evaluation of their own projects. The understanding of success however, can vary depending on the meaning of the 'project' for the stakeholder who defines the success: some of the cases were defined as successful although not all of the 'traditional' criteria for success were addressed. The Hague case was not financially profitable but was seen as a great learning experience and was hence considered a success by the stakeholders as well as by the media and research bodies. Their measurement of success therefore was not only based upon the outcome of the project, but also on the on-going process of project implementation. Stakeholders with a more straightforward business mentality however, such as Kungsbrohuset, might not view The Hague case as successful due to their perception and definition of success, as their expectations of their projects are focused mainly on profitability.

It follows that the understanding of success also depends on the stakeholder defining success and their position relative to the project: MCIA states the Morris Model was successful because they were able to develop an alternative financing model which allowed profits; for Morris County it was a success as they were able to reduce their

carbon emissions and save money; for the schools involved it was a success because they were able to install PV that they could not have afforded otherwise, and in addition to use them as a sustainability education tool; for solar developers it was a success as it allowed them to expand their business with very low financial risks. At the same time, our data showed that it might also be the case that some of the local people do not consider it successful as they do not fully trust the government and see the Morris Model as a way of using tax payers' money on something that may, in their opinion, not be necessary.

For each individual energy initiative therefore, there are a potential variety of factors that could determine the success of the project. These are not limited to the more conventional measures of cost and energy savings, which are more straightforward to quantify and present as objective, whereas the more qualitative factors presented and discussed here are less tangible and subjective, and more dependent on the perspective of the stakeholders, suggesting that the factors of success can vary from project to project depending upon the context in which they are implemented, and that the perception of success can vary amongst various stakeholders of the same project. Process and outcome become entwined such that the way a project is carried out becomes as important as what is finally delivered and, moreover, lessons from the process and partnerships developed become outcomes in themselves, helping to shape and make possible further projects.

In a relatively nascent field of activity, such as DE, learning from 'process' can be understood by many to be as important as 'outcomes' in the more conventional sense. Room and opportunity must be found for projects that enhance our understanding of how to successfully develop and expand DE, and establish the networks, knowledge,

and evidence base that if required in order for it to fully reach it's potential. In the short term therefore, it could be argued that we should be more forgiving of projects that fall short of our initial expectations in a conventional sense as long as they contribute in some part to the wider process of shaping, refining and establishing DE as a key part of our energy system.

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