



**“COMPLEX CLEANTECH SOLUTIONS.  
AMPLIFYING THE COMPETITIVENESS OF DANISH BUSINESS”**

**An evaluation of the practical and theoretical contribution of the  
CLEAN/CCS initiative**

**Karel Cool  
BP Chaired Professor of European Competitiveness &  
Professor of Strategy  
INSEAD**

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## I. Summary evaluation of the CCS Project

This report provides an extensive evaluation of the CCS project. It discusses 1) the importance of the work of CLEAN, 2) the creation and functioning of CLEAN to enhance the competitiveness of Danish SME's, 3) the Co-creation model of CLEAN, 4) the Competitiveness Amplification Model (CAM), and finishes with a general discussion and recommendations for taking the project forward. Below, I provide a brief summary following the general criteria set out by the sponsors of the CCS project.

### Input: what competences does the project deliver?

The CCS project delivers a practical model and methodology to help Danish small and medium sized enterprises (SME's) enhance their competitiveness for participating in projects in the cleantech sectors outside Denmark. It also is a blueprint for helping the competitiveness of Danish firms in other sectors.

### Activities: what is put to work as a part of the project and who is going to be involved?

Danish SME's are brought together to help provide integrated, complex cleantech solutions to local governments outside Denmark. Danish SME's face increasing difficulty in competing for these projects. The work of CLEAN, and the CCS project in specific, helps these companies enhance their global competitiveness.

### Output: what change in the behavior of the participants due to the activities in the project?

Specifically, some of the participating companies have signed (or are preparing) one or several Memorandums of Understanding (MOU's) to deliver cleantech projects in India, Morocco, Senegal and China. More generally, they learn how to better compete in international markets.

### Outcome: what does this change in the behavior lead to?

The outcome is crucial: an enhancement of the competitiveness of Danish SME's in the cleantech sectors as well as a methodology for extending the learning to other sectors in Denmark and/or SME's in other countries with similar issues.

### Impact: how does the project benefit to society

It helps Danish entrepreneurs, their employees as well as other stakeholders increase their global footprint, bring wealth to the Danish economy, improve the skills of

collaborating companies in the local economies, and improve the well being of the people who benefit from these projects.

## II. The importance of the work of CLEAN

The work described in the CCS project report of CLEAN is important both from a practical and theoretical point of view. Practically, there are many small and medium sized enterprises (SME) in Europe that face the same challenge as the Danish SME's: how can they tap the new growth markets for their products and services? Theoretically, the "public good" created by CLEAN for the Danish SME's is very interesting, important and has potential for application in other sectors and countries.

First, from a practical point of view, large multinational companies (MNC) typically have an international or global infrastructure, which gives them more readily access to information about new markets. They also can more easily find local partners to cooperate with or to establish a long-term relation. They are also in a better position to take on risky ventures as they tend to be more diversified geographically and product wise. Further, they have more readily access to external financial resources than domestic firms. In addition, large companies tend to have more leverage with governments and their institutions, which may help them expand internationally.

As long as SME's can benefit from strong local demand or can sell to MNC's that help them internationalize, SME's can prosper. However, when local market demand is stagnating and / or SME's can no longer advance in the wake of the MNC's that restructure supply chains and sometimes cut out SME's, they risk getting stuck and face a competitiveness challenge, even though they may have significant skills.

Access to international markets is particularly difficult for SME's that sell "project based" products and services. When selling common consumer goods or services (e.g. books, soft drinks, travel), SME's may have a disadvantage in tapping international distribution channels, but access is possible. The digitization of the economy is further reducing this disadvantage. However, project based sectors, as the ones dealt with in the CCS project report, often face unique challenges that put SME's at a sizeable disadvantage compared to their large competitors. As transactions tend to be infrequent, it is particularly expensive for SME's to develop an international marketing infrastructure. They may neither have the skills to negotiate internationally as it may not be profitable to invest in these for one-off transactions. Further, buyers tend to be very risk averse as the result of the characteristics of the project (e.g. water, energy works): these need to be operational for a long time. In these cases, buyers tend to prefer large, established firms, partly because they can demonstrate a list of international projects and because they are believed to have staying power. When these buyers are also elected governments or

government institutions, they may be particularly risk averse as electoral concerns and critiques enter the decision-making context.

The above concerns get amplified when the customer base is very fragmented. When projects concern sales to a concentrated customer group, it pays to invest in customer relations, especially when ongoing relations can be expected. The size of the transactions tends to be larger and there is scope for continued business. For example, machine tool suppliers to the car industry also face infrequent transactions, but it is possible to invest in a relationship since one can expect recurring business. However, when projects are infrequent and the customer base is fragmented, SME's stand at a very significant disadvantage. To the extent that the customer base is international, domestic SME's tend to be trapped in their home market.

The structural slump in demand in Europe and the shift in demand away from Western Europe make the above competitiveness concerns for SME's operating in project-based sectors even more significant. Especially for the sectors that are the focus of the report, demand is frequently linked to infrastructure works, for which there is growing demand outside Europe and shrinking budgets in Europe. SME's with capabilities find themselves sidelined in these international projects and need a collective effort to stand shoulder to shoulder with the MNC's. The work pioneered by CLEAN is therefore very important.

Second, from a theoretical point of view, the development and functioning of the CLEAN initiative and organization is very interesting. As described above, the SME's in the sectors that are considered often lack the incentive to invest in international expansion. As a group of SME's involved in the same sectors, they would benefit from having an organization that invests in the capabilities to spearhead international expansion. When such an organization exist, the tendency is often to "free ride" on these organizations, i.e. to limit private investments to make the organization stronger – as the benefits are appropriated also by other firms – and to "cherry pick" the benefits from these collective organizations. This is the classic situation of investments in public goods such as "security", "health", etc. In these settings, actors tend to under-invest and over-consume. The problem in economics is know as the "tragedy of the commons" (Hardin, 1968) and was worthy of a noble price in economics for the work by Prof. Elinor Ostrom in 2009. Key issues in this matter are how to set up such a collective organization, and equally important, how to keep it functioning in the presence of free-rider pressures. The organization of CLEAN that interfaces with local governments, government embassies, local SME's and foreign government entities is a very interesting and important example of how to organize a public good and create positive externalities for all parties involved.

This report will assess the work of CLEAN as related to its Complex Cleantech Solutions (CCS) project. The assessment will be done along several dimensions: the creation and functioning of CLEAN; the field work of CLEAN as structured by the “Co-Creation” model; the “Competitiveness Amplification Model”; and avenues for the successful extension of the work of CLEAN. Throughout, the evaluation will consider both the practical and theoretical relevance and importance of the work of CLEAN.

### **III. The creation and functioning of CLEAN to enhance the competitiveness of Danish SME's**

The CLEAN/CCS project started from the realization that the complex environmental challenges that most countries face are simultaneously very significant business opportunities for many Danish firms offering cleantech solutions. However, as many of these firms are not of the scale to compete globally by themselves, they risk being shut out from this opportunity. The belief was that collectively, these SME's can become a competitive force since individually, they offer competitive skills and solutions, and collectively, their complementary skills can be bundled into comprehensive solutions for complex environmental problems.

The challenge is framed as a national competitiveness issue, meaning that the challenge is structural and that collective action is needed to overcome the challenge. It is structural in the sense that it is not a cyclical or temporary problem that the Danish SME's in the cleantech sector face. As described above, the nature of the services they supply and the nature of demand they target poses long-term problems. It is also assumed that collective action is needed since the SME's by themselves cannot overcome the structural disadvantages they face. The Danish SME's are said to collectively represent a wide range of competencies in the area of cleantech, but the international customers are looking for integrated solutions, and not just for a set of very specialized services.

The challenge of addressing structural competitiveness problems and of organizing collective action has a long history in industrial policy. I will first highlight some of the debates in these areas and then comment on the uniqueness of the CLEAN/CCS approach.

#### Drivers of national competitiveness

In the past several decades, regulators, strategy scholars and practitioners have defended various views of what "competitive" firms and "competitive" industries are. The sixties and seventies in Europe were characterized by the belief that governments were better than customers and competition at determining winners. With a heavy interventionist agenda, governments and management set out to construct National Champions in "strategic industries". These anointed firms were to be the engines of growth, wealth and pride for the country, a national asset and a key resource in the international

competitive arena. Out came the firms and industry structures we have in transportation, telecommunications, chemicals, petrochemicals, utilities, steel, electronics, etc.<sup>1</sup>

The belief that firms could be designated as the engine of international competitiveness was shattered towards the mid-to-late seventies. Competition was quickly becoming global with the new Asian competitors taking the initiative. In the aftermath of the oil crisis, it became clear that big national champions often had become dinosaurs with bloated cost structures: a protected species. The firms that had tried to become competitive in international markets often found themselves disadvantaged by the legacy of the industry structures built in this era. For example, the European petrochemical industry has long suffered from overly nationalistic investments in refineries, crackers, derivatives, etc, and we see the dire consequences of these decisions still today.

Surprised by the “Japanese Miracle”, the search for a cure started in earnest. Sociological and management research in the early eighties led to a flurry of publications on the Japanese “Management System”. Some of the early findings were that Japanese firms had unique cultural characteristics, benefited from the Japanese regulatory/institutional context (“MITI Inc.”), could count on a workforce whose loyalty and hard work were beyond doubt, provided life-time employment guarantees, benefited from the lowest cost of capital, etc. The competitiveness drama in Europe (and the US) had found an explanation and a cure. Europe needed to change its institutions and infrastructure and move towards the Japanese System. A second wave of interventionism was started. The message that management creates competitive firms, not governments, still had not sunk in.

Quite soon, it became clear that the competitiveness of the Japanese firms could not be reduced to a cultural, institutional or country trait. Rather, it was the outcome of thirty years of investments in world-class skills and resources in manufacturing, R&D, marketing, after-sales service, etc. An iceberg had formed with an observable tip that concealed its vastness. By the mid-eighties, Japanese companies had acquired world-class competencies in new product development, reducing cycle time, exploiting economies of scale and manufacturing flexibility, being a low cost competitor with a differentiated product offering, etc. They had also experimented with new organizational processes (TQC, JIT, etc.). Since these processes involve a substantial amount of “learning” (experience curve effects), they gave Japanese players an advantage that was

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<sup>1</sup> K. Cool, D. Neven and I. Walter, *European Industrial Restructuring in the 1990's.*, MacMillan, 1992. And COOL Karel, James Henderson and Rene Abate, *Restructuring Industry*, SMS Book Series. Blackwell Publishing, 2005.

going to be difficult to match. The terms “competence based competition”<sup>2</sup> and the “resource based view”<sup>3</sup> of competitive advantage were coined with firms such as Canon, Komatsu, Honda, Matsushita held up as the benchmark.

Today, the magic of the “Japanese system” has largely disappeared. While the “Keiretsu” system is unique to Japan, it does not solve the competitiveness issues of all Japanese industries and firms. Many Japanese firms are still world-class and set the benchmark for competitiveness. The belief that this is due to a farsighted governmental effort has largely waned however.

The onslaught of the South Korean and Chinese firms over the past decade has triggered a competitiveness debate similar to the one heard regarding the Japanese firms. The “Chaebol”<sup>4</sup> structure and the close relation with government institutions are often argued to be the key reasons for the success of Korean firms. Similarly, the farsighted selection by the Chinese government of the key strategic industries and their unwavering support is given much credit for the international success of the Chinese firms ...

After several decades of competitiveness initiatives and debates, It has become abundantly clear that **government initiative and support is never a substitute for firm competitiveness**. Firms that lack the skills to be competitive in the international arena can be propped up for a while but very rarely can be successful **in a sustained way**. They need to develop and/or acquire the needed skills and resources to compete for national and international opportunities. This often requires time-consuming investments at the level made by international competitors.

While government action cannot be a sustained substitute for firm competitiveness, it can however be a **complement** to a firm’s efforts to become competitive at the national or international level. A key structural factor is the **legal and governance context** that is created to help firms prosper. A clear government policy at the national and European level that supports the development of competitive industries whereby firms have the freedom to act within well established consolidation and cooperation rules is a key

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<sup>2</sup> Hamel and Prahalad, “The core competence of the corporation”, *Harvard Business Review*, 1990.

<sup>3</sup> Dierickx and Cool, Dierickx, I., and K. Cool, “Asset Stock Accumulation and Sustainability of Competitive Advantage”, *Management Science*, Vol 35, No 12, pp. 1504-1510, December 1989. Cool, K., L. Almeida Costa, and I. Dierickx, “Constructing competitive advantage”, in *The Handbook of Strategy and Management* by A. Pettigrew and H. Thomas (eds.), Sage, London 2002.

<sup>4</sup> South Korean term for “business conglomerate”

requirement. Firms can thus develop the required minimum efficient scale through external growth and become competitive internationally.

When consolidation to get to world class levels is not feasible because firms such as SME's often lack the means to participate in industry consolidation, firms should be empowered to pursue cooperative strategies to find collective solutions to collective challenges such as overcapacity, restructuring, international expansion, etc. Some industries have developed effective coordination mechanisms and have achieved a world-class status (e.g. the French champagne industry to which I return later.<sup>5</sup>) However, such a cooperative approach again assumes that governments (and the European Commission) give firms the latitude to establish cooperative structures and strategies. As always, they will need to respect the anti-trust laws of European Competition laws, and increasingly the anti-trust laws of the major trading nations of the USA and China.<sup>6</sup>

Are Danish SME's in the Cleantech sector a credible target group to receive government and NGO help to access international growth markets? The report does not discuss the competitive and financial health of the Danish SME's in the sector. Absent this information, it is impossible to predict whether a concerted effort among these companies will lead to sustained, international success. Clearly, deficient firms will not get sustained success by cooperating in international markets, even if supported by an inspired initiative such as CLEAN. While Denmark is known for its "green" capabilities, it is not clear from the report that the participating SME's are "stuck" because of deficient capabilities, or because of the nature of the market conditions, as outlined above.

Some type of "stress test" should be developed and applied to the SME candidates. On the other hand, SME's that are competitive in a very specialized field but lack complementary skills and resources to offer competitive, integrative solutions may be excellent candidates for cooperative international efforts.

I believe it would be very useful to examine whether there are common characteristics among the firms that benefited from the CLEAN/CCS initiative. This would help very much

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<sup>5</sup> K. Cool and J. Henderson, "Maintaining Common Assets, Tragedy of the Commons and Supply Chain Performance" in COOL Karel, James Henderson and Rene Abate, *Restructuring Industry*, SMS Book Series. Blackwell Publishing, 2005

<sup>6</sup> K. Cool, N. Harlé and P. Ombregt, "Merger Control in the BRIC Countries vs. the EU and the US: The Facts", June 2012, <http://knowledge.insead.edu/blog/insead-blog/merger-control-in-the-bric-countries-vs-the-eu-and-the-us-the-facts-2742>; and K. Cool, N. Harlé and P. Ombregt, "Merger Control and Practice in the BRIC Countries vs. the EU and the US: Review Thresholds", August 2012, <http://knowledge.insead.edu/blog/insead-blog/merger-control-and-practice-in-the-bric-countries-vs-the-eu-and-the-us-review-thresholds-2724>

in deciding whether to roll-out this initiative to other industries or countries, and to determine the types of companies that should be involved.

#### Collective action and harnessing free-riding

Invariably, there is variation in the skills and resource base of companies, and some companies will look to others for taking the lead. This is where the risk of “free-riding” lurks, and could undermine long term success. The effort of CLEAN to foster co-creation and international success is predicated on the assumptions that the participating firms are competitive and willing to contribute to a collective strategy.

The Clean report stresses the importance of establishing trust among the transacting parties. In the absence of strong contractual mechanisms or a hierarchical structure that can impose a decision, cooperation to build “common resources” such as trust, common knowledge and reputation, relies heavily on the contribution of all parties to the common good. The sustained operation of such cooperation has been famously linked to “the tragedy of the commons” by Hardin (1968). He developed the “tragedy” metaphor to illustrate the problems of non-contribution to and over-use of common resources such as fisheries, common pastures or forests that are accessed by similar players. Hardin asked the reader to imagine what would happen to a common pasture if each herder were to add a few sheep to his herd. Since each grazer would reap all the profits from these extra sheep but only a fraction of the costs of overgrazing, the result would be a tragic loss of common pasture for the entire community. In other words, if the marginal cost of adding a sheep to the commons is zero since access is free, and marginal revenue is positive as long as there is grass, each individual grazer has an incentive to add sheep until there is nothing left. His conclusion was that “freedom in the commons brings ruin to all” (Hardin, 1968).

The development of the CLEAN/CCS initiative is an example of the establishment of common resources (trust, reputation, knowledge) that is used by a number of SME’s. There are many examples in other industries of the establishment of common resources: introducing new technical standards (e.g. GSM, LTE vs. WiMax); developing payment systems (e.g. smart cards, Apple Pay), marketing a common brand name and reputation (e.g. milk, champagne, etc). The individual incentives of the firms are very similar to the grazer in the tragedy of the commons: when a collective reputation is already established, it is very tempting to just benefit from this common resource and to minimize contributions. Further, as the contribution of an individual player benefits not only him but also the others, it is tempting to minimize individual contribution to the common good. In other words, one might expect participating firms in CLEAN/CCS and similar

initiatives to delay formulating their plans and pricing until they have seen what others have done; postpone international trips to fairs and workshops and wait till others have committed first; let other firms deal with project financing issues when this occurs; wait for someone else to take over the leadership once the contracts are signed, etc.

The tragedy of the commons is far from inevitable however. Research has shown that cooperative governance mechanisms can work. For example, relational based transaction mechanisms, such as in the Japanese car industry, which rely neither on detailed contracts, nor on third party enforcement, can be used to safeguard transactions (Dyer, 1997; Dyer and Singh<sup>7</sup>). Typically referred to as self-enforcing agreements or private ordering (Telser, 1980; Sako, 1991<sup>8</sup>) transactors rely on trust, reputation or investment hostages as a way to safeguard against opportunistic behavior.

The work of 2009 Nobel price winning economist Elinor Ostrom has however been the most influential in defining the factors that allow common resources built by collective action to prosper. She conducted her field studies on the management of pasture by locals in Africa and irrigation systems management in villages of western Nepal. Her work has considered how societies have developed diverse institutional arrangements (“rules”) for managing natural resources and avoiding ecosystem collapse. This work has also been applied to business settings and my work on the exceptional global success of the champagne industry on the basis of co-operation / co-creation between the grape growers and the champagne makers follows in this tradition (Cool and Henderson, 2005). This and other work<sup>9</sup> has uncovered a number of factors to be taken into account to build and maintain common resources such as reputation and trust at the level of an industry or group of companies. In essence, the champagne industry has developed a self-regulation structure that adheres to a number of rules and practices. Some also appear important to keep in mind to maintain the CLEAN/CCS momentum. The main rules and practices are briefly described below:

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<sup>7</sup> Dyer, J., 1997. Effective interfirm collaboration: How firms minimize transaction costs and maximize transaction value. *Strategic Management Journal*, 535-556.; Dyer J., Singh, H. 1998: The relational view: cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review*, 23, 660-679

<sup>8</sup> Telser, L. 1980: A theory of self-enforcing agreements. *Journal of Business*, 53, 27-44; Sako, M. 1996. Supplier associations in the Japanese automobile industry: collective action for technology diffusion? *Cambridge Journal of Economics*, 20: 651-671.

<sup>9</sup> For example: Paul Aligica and Vlad Tarko, “Institutional resilience and economic systems: Lessons from Elinor Ostrom’s work”, *Comparative Economic Studies*, March 2014.

- Restrict access to the common asset: If any company can join the initiative, no one may be willing to be the first to contribute to the common reputation since others may be able to free-ride on the work of this company.
- Create transparency / monitoring so adherence to agreements is established. If participants can free ride while the other players cannot see it, it will trigger free riding or the suspicion of it, undermining individual contributions.
- Enforcement of agreements. If participating firms can visibly defect on their agreements to contribute, and get away with it, it will accelerate the unraveling of the initiative. Therefore, there must be enforceable / agreed-to measures regarding the forced exit of participants. Gradual measures work best.
- Cooperation must be seen to be worthwhile. While obvious, this critically depends on the “discount rate” or patience of the participants. Participants with a “high” discount rate with respect to expected future benefits will want to see immediate returns and be the first to exit. Firms tend to have a “high” discount rate when they either high fixed costs, high debt exposure, or both.
- Role of trust among participants. If incentives for cooperation are strong enough, trust is not essential as participants will cooperate because of the expected benefits. When the cost/benefits of cooperating/co-creation are less clear, it helps to know how the participants resolved their problems in the past. If there is a history of cooperation (“let’s work this out” attitude), then one can expect trust to become stronger. Vice versa, if participants tended to shirk the moment the cost/benefit balance is unclear, future cooperation is endangered. The beginning of the momentum is very important because it tends to create a chain reaction in the positive sense – or the negative sense.
- Leadership among participants. If there is a “natural” leader among the participating firms that does not mind that others may free ride to a certain extent, then momentum for cooperation is helped.

While there are other considerations, the above tend to be mission critical. Absent these conditions, it is unlikely a co-creation/cooperation initiative will be long-lived in the absence of continued shepherding by the CLEAN Team.

The CLEAN/CCS initiative started with a conference in August 2012 where potential demand for the cleantech firms was discussed on the basis of the very well executed “Global Cleantech Report”. This was an excellent way of showing the “future benefits” of co-creation and of motivating the way to get these benefits -- by cooperation rather than competition among each other.

There is ample evidence in the report and from discussion that the CLEAN Team was very instrumental in shepherding the Danish companies along (workshops, foreign visits, coordination with Danish cities, the Danish Embassies, etc.). Developing trust and traction across different countries, industries and projects is a monumental task. The work of the CLEAN Team provided a powerful impetus to the construction of a self-sustaining competitiveness effort. The Clean task was particularly challenging since reputation and trust needed to be built among participants from several different countries, where participants also changed as the projects unfolded. As the conditions for sustainable co-creation are particularly challenging, the CLEAN organization and team (or a similar organization) will most likely have to stay involved to create a persistent competitiveness effect.

#### IV. The Co-creation model of CLEAN

The CLEAN organization pioneered a very interesting model to jumpstart and manage the co-creation initiative among SME's in the cleantech sector. As the report points out: "Danish companies, universities and public authorities find it problematic to get together and often act individually, making it difficult to gain an overview of market opportunities, players, technologies etc. and to endeavour to develop, for example, waste disposal systems etc." As mentioned above in this report, co-creation is being done in other sectors, but the scope of the efforts of CLEAN (governments, universities, SME's, different countries, changing coalitions) is quite unique.

The "CLEAN model" that was pioneered strikes a very good balance between "practical necessity" and "academic logic." As discussed above, it also evolved along the way and lead to the "Competitiveness Amplification Model (CAM)". I'll comment first on the CLEAN model and thereafter on the CAM model.

The model is presented in a very elegant way by the five-step co-creation model:



Figure 1: The CLEAN / CCS Model, from CLEAN, "Complex Cleantech Solutions", November 2014

The report discusses the dilemma's that were encountered at each step along the way, the choices that were made by the CLEAN Team and the positive and negative consequences. The case studies of the actual projects show the actual challenges the Team faced and the subtlety of their approach.

##### Market Analysis

The Market Analysis stage is very well done. It is helped by the "Global Cleantech Report" that paints the opportunities for Danish Cleantech companies in nine sectors around the world. The report is very valuable in the sense that it gives a broad sweep of the opportunities around the world. It is less a map for immediate action as focus is needed to get started. The stated priority to identify the "pull of the market" rather than "push

what is available in Denmark” is very sound. It lays the basis for sustained market opportunities rather than for just pursuing scattered opportunities.

The CLEAN Team lays out the challenge of how to narrow down the search: which sectors in priority and at what level of analysis (micro vs. macro)? The Team focused primarily on “waste, water and PV solar” and on problems at the city level. The focus seemed to be less geographically focused; projects were explored in all the BRIC countries, the Middle East (Turkey, UAE), Africa (Morocco, Senegal) and Europe (Italy).

When starting up an initiative such as CLEAN, there is inevitably an opportunistic element and opportunities are pursued where they are seen. The wide geographic reach of the projects of course makes the effort to pursue the opportunities and to maintain the momentum around the world very resource intensive. The fact that, as of January 2015, the projects are active only in China, India, Morocco and Senegal,<sup>10</sup> is most likely a positive evolution, allowing CLEAN to focus its resources and amplify its impact from these bases.

The Kenya Case study shows the creativity of the CLEAN Team in bringing together public resources (Embassy), processes (participating in conferences) and people (relationships), but also the difficulty if project owners do not have “ownership” in the co-creation project.

### Relationship Building

The Relationship building stage of the CLEAN model addresses the need to turn an opportunity into a potential project. The Team stresses the importance of the “Memorandum of Understanding (MOU)” with the local authorities / project owners. The report points out the difficulty in reconciling the “short-term transaction” pressure of the businesses and local authorities, and the “long term relational” need to build up trust and reputation capital that will potentially lead to further business opportunities. This is a tension that is inherent in any “common resource” project, as pointed out before. One interesting aspect is the dilemma of building personal or organizational relations among the parties involved.

The SSGKC project in China illustrates the importance of demonstrating commitment to the local authorities (i.e. projecting a long-term interest) and of following due process (workshops, visits, etc.), taking into account and paying respect to local requirements and

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<sup>10</sup> Based on “Status of MOU”, provided by Neelabh Singh, Head of Strategic Projects, CLEAN

habits. The Krasnodar case illustrates the potential peril of trying to build long term relationships with political authorities, who inherently are short-term focused.

### Organizing and Involvement

The Organizing and Involvement stage is concerned with the matter of when to get the relevant companies on board. The report stresses that this stage and the previous stage are very intertwined, which is to be expected: building relations cannot be done without involving the parties to the relationship. Nonetheless, if the SME's -- which may be resource constrained -- are involved too early, they will lose interest. The report stresses correctly the importance of providing specific, credible information to the Danish SME's so they can make up their mind whether to invest in the relationship. The mechanism that the CLEAN Team developed, the "Concept Paper" which describes the key parameters of the projects, is very well conceived.

The report also stresses the need for the CLEAN Team or a similar organization to remain involved. One might expect that companies would take over the lead at some point so that the CLEAN Team could retire in the background and pursue other opportunities. The report provides an interesting comment: "In theory, it would be natural for one of the members of the Danish group to take over the lead, but this was not the case in practice. Hence, CLEAN has kept the role as facilitator and in some senses lead of the Danish group to a later stage in the model than was anticipated at the beginning of the CCS project. As an organization managing a project like the CCS project, the aim is to follow the method set up at the outset. However, on a practical level working with specific cleantech challenges anchored with authorities from around the world, it is not possible merely to stick to academic theory. In practice, it is necessary to be true to the relationship that has been built, and thereby aid the process for as long as needed." (p. 38).

As argued in section II above, academic theory on collective action for building common resources in fact predicts that CLEAN would need to stay involved. Parties with a short term focus ("high discount rate") will refrain from committing resources, especially when proposing "integrated solutions" as is the case here. In these situations, companies may perceive that the efforts they will make will benefit also those companies that do not actively commit, and will therefore become reluctant to commit themselves ... To counter this at the early stages of an initiative such as CLEAN, the Team needs to stay on board and continue to build the relationships. The Italy/City of Milan case illustrates that even though a leader among the companies may emerge, the leadership is "fickle" at the beginning as reputation building is at its early stage.

The Indonesian case shows the effect of a lack of commitment on building a common project. In this case, the local company turned out to be not committed, which triggered a decrease of interest from the Danish companies. Clearly, the incentives of all parties must be aligned. If all have a short-term interest, then the “tragedy” takes place very quickly.

### Co-creation

The fourth stage of Co-Creation is critical as it concerns the actual forging of the integrated solution for the client, as well as the construction of the integrated action of the Danish suppliers -- in concert with the local partner. If the costs of integration are seen as too high, parties with a short term focus / high discount rate will defect and choose not to contribute. CLEAN or a similar organization is very much needed to reduce the cost of the coordination / co-creation and to explain and enhance the long-term benefits so that, on balance, parties with a short term focus / high discount rate will feel incentivized to contribute and co-create.

As all this takes place in an environment with high information asymmetry (the parties know little about each other and the projects / opportunities). Creating opportunities for information creation and exchange is critical. The CLEAN report points this out correctly, and CLEAN’s execution through the workshops that were organized locally, including site visits and social events, goes a long way to address this issue. This again illustrates the high importance of the CLEAN Team in constructing “the common good.”

The report also identifies a key task of CLEAN or a similar facilitator: the securing of financing. If the parties trust each other, but there is no money to finance the project, it will naturally not even start. Infrastructure projects are, on the whole, resource intensive. Again, if one company has to solve the problems for the entire consortium of companies working on the integrated project, but cannot appropriate all the benefits of this action, it will be reluctant to make the effort to find the finance. Either CLEAN -- or a similar organization -- will need to provide it, or the specific company will need to receive extra compensation for its role in organizing the financing. Moreover, as the Danish companies are SME’s, they may find it particularly onerous to find financing, especially as financial institutions may consider that the SME’s are a high credit risk since they take on projects which are outside their usual domain of action.

The Morocco case shows that finding integrated solutions can be very costly for the Danish parties. When in addition to this extra cost, also the need to find financing is imposed on the contracting parties, the co-creation will unravel as the future benefits are overshadowed by the short-term costs. The Senegal case innovates an interesting solution to the financing issue: involve financial institutions during the workshops. This way, they can better assess the project risk and the credit risk of the companies.

## Implementation and Communication

The Implementation and Communication of the Results stage completes the CLEAN model. As formulated in the report: “The aim of this phase is to ensure further development and implementation of the draft projects. Hence, the implementation phase encompasses both the process after co-creation and the actual implementation of projects.” This phase is naturally interconnected with the previous stages. Specific challenges involve: “Firstly, facilitating the last part of the process and handing it over to the group of companies, and secondly, the delicate process of financing and tenders.”

The CLEAN initiative does not yet have a lot of experience with this stage as only one project has reached this stage: the Indian Mithi River Protection project. **This project however also illustrates the competitiveness amplification potential of the CLEAN initiative when required conditions for co-creation are united** (well defined local authority, a very sizeable long term opportunity -- \$100 million, much larger than any other --, local information that reduces the information asymmetry about costs and benefits for the Danish firms), **and when due process is followed to avert the tragedy of the commons** (many workshops in India and Denmark to exchange information and develop trust, an ongoing involvement of the CLEAN Team to build trust in realizing the long term benefits and minimizing the costs of forging an integrated solution in a market the Danish companies are not very familiar with). The project also emphasizes the need **to take the time to build the common resources of trust, reputation and knowledge**. Trust is earned and cannot be acquired. It takes a series of consistent investments / commitments to develop this. The Mithi project was constructed over a period of two years – and will need ongoing nurturing and commitments to bring it to fruition.

In conclusion, the CLEAN Team and Organization pioneered a very innovative approach to identify market opportunities that Danish SME’s would not have access to, and a five-step process to help them realize the opportunities. The wide geographic reach of the CLEAN ambition probably was a hinder to focusing resources. However, the focus on the three sectors of waste, water and PV Solar helped. The task of forging “common resources” is known to be affected by “the tragedy of the commons”. As the CLEAN Team showed with the Mithi project, and potentially with three more, by understanding and maximizing the incentives of the contributing parties (minimizing ST costs, maximizing LT benefits) and by creating a process that fosters the creation of the common resources, the tragedy can be overcome.

## V. The Competitiveness Amplification Model (CAM)

The CLEAN Team generated impressive results in a very challenging situation. On the one hand, there are Danish SME's that have specific skills in a segment of the cleantech industry. They have developed their skills and business in Denmark, but see that the demand for their services long term is shifting to different continents. As their international experience is limited, it proves very challenging to access these new opportunities. On the other hand, there are a large number of cities, regions and countries that face complex environmental problems and that want a "make-over", a solution that addresses the many elements of the complex problem set. While country governments can more readily tap the skills and solutions of large MNC's working in the cleantech sector, the local governments often do not have the skills or resources to seek and develop solutions to the complex problems at the local level. Thus, an opportunity is not seized; a problem is not solved.

The vision of Industriens Fond's and CLEAN's leadership was exceptional as a "mechanism" was created to solve the problem for the Danish SME's, and of the local authorities in need of an integrated solution. The work of the CLEAN Team was also exceptional as a method was created to realize the vision.

It is clear from the report and from discussion that a lot of "on the job" learning took place, and fast, to become an efficient facilitator of business opportunities and solutions. As the Team gained deeper insight into how to become a more effective and efficient facilitator, the realization grew that the CLEAN co-creation model could be streamlined, and that other sectors of the Danish economy could benefit from similar facilitation. This was the trigger for the development of the "Competitiveness Amplification Model."

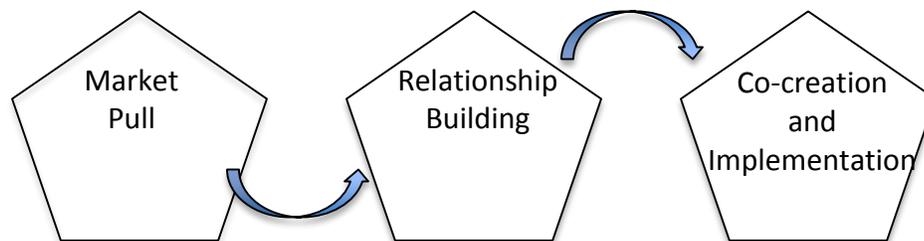
Two major insights were gained: 1) the model is not linear but a process with a feedback loop ("closed loop"), and 2) the Cleantech sector is not unique in its challenges and thus can be a very useful "case study" and basis to generate a model that can be applied to other sectors. I will comment on both points.

### Linear vs. closed loop model

The CLEAN model of Figure 1 above is presented as if the five steps are independent and linear. That is, each stage represents an identifiable and separate task, and all tasks are to be executed in a sequential fashion. This representation is very often made in a very early stage of model building. It focuses on the key tasks to be accomplished and not on the possible interconnections.

The first step dealing with Market Pull is most likely the most independent step in the model. As the CLEAN mission is to avoid “a push” of fragmented solutions but to develop the “pull” of integrated solutions, it starts with an exogenous reality: market demand. The other four steps turn out to be very interdependent. On many occasions in the report, the observation is made that there is no clear beginning or ending of the stage. For example, it is mentioned that Step 3 “is closely linked to Step 2, as the lines between the two are quite blurred, and it will rarely if ever be the case that Step 2 is finished before Step 3 is begun.” (Report, p. 36).

This interdependence may imply that originally too many steps were identified and that the model could be simplified. Thus, a simple linear process could have been conceptualized as, for example: “Market pull – Relationship building – Co-Creation and implementation”.



**Figure 2: Alternative formulation of the CLEAN model**

This “higher-level” model represents tasks that are more independent and sequential. However, from a practical and theoretical point of view, also this “linear” representation is inadequate. Practically, the Team experienced very often that as “relationship building” improved, new “market opportunities” were uncovered. Similarly, it found that “relationship building” is essential for better “co-creation”, but also vice versa, that as “co-creation” took shape, “relationships” improved, which opened up new “market opportunities.”

Theoretically, the construction of “common resources” such as trust, reputation and knowledge follows a “closed loop” or “feedback process” where past cooperation / co-creation in situations where incentives to cooperate are not strong, favors further cooperation / co-creation, and vice versa, where past free-riding in situations where incentives to cooperate are not strong, triggers further free-riding, etc. This is the essence

of the “tragedy of the commons” dynamic when incentives for cooperation or defection are not very strong. A graphical representation could be as follows:

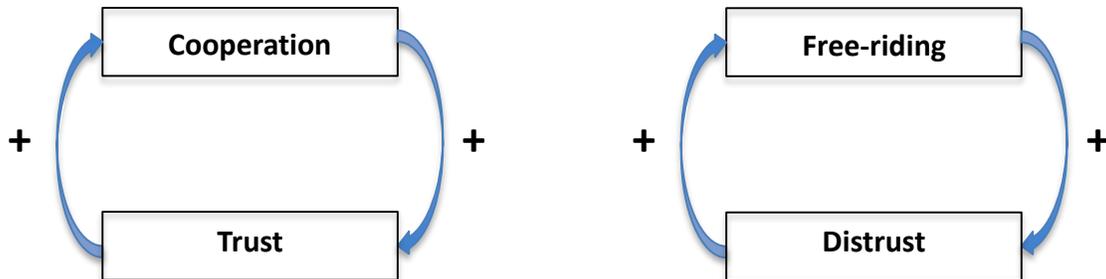


Figure 3: Feedback loops of cooperation and defection

Such non-linear feedback models have a long tradition in “systems dynamics” thinking and can be formalized with the software modeling tools of iThink or Stella.<sup>11</sup> An extensive and practical discussion of the principles and tools of systems dynamics can be found in the work of Morecroft (2007)<sup>12</sup> and Warren (2008).<sup>13</sup> Other applications can be found in the work of Cool, Dierickx and Almeida Costa (2014).<sup>14</sup>

#### The CAM model

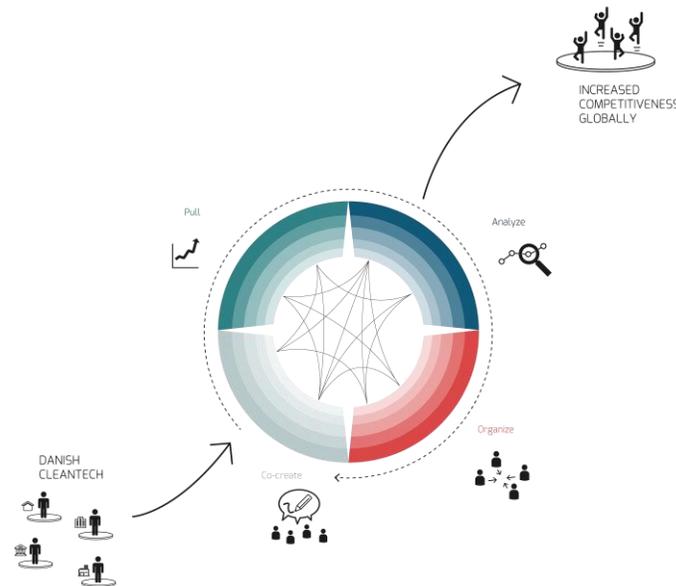
The Clean Team has correctly sensed that there is a reinforcing dynamic at work in “Co-Creating” common resources and business results. Their modeling of the co-creation dynamic is as shown in Figure 4:

<sup>11</sup> <http://www.iseesystems.com/Resources/Whitepapers.aspx>

<sup>12</sup> John Morecroft, *Strategic Modeling and Business Dynamics*, Wiley, 2007

<sup>13</sup> Kim Warren, *Strategic Management Dynamics*, Wiley 2008

<sup>14</sup> Karel Cool, Ingemar Dierickx, and Luis Almeida Costa “Asset Mass Efficiencies”, “Diseconomies of Time Compression”, and “Dynamics of Resource Erosion”, *The Palgrave Encyclopedia of Strategic Management*, 2014



**Figure 4: The Competitiveness Amplification Model of CLEAN. Source: "Complex Cleantech Solutions", November 2014, p. 73**

It differs in three ways from the early CLEAN model: 1) it is summarized in four steps and some of the steps have been aggregated (co-creation and implementation), while others have been separated (pull demand and analyze demand), and 2) it is formalized as a “closed loop” model, embodying a feedback process, and 3) it lists specific measures to track progress in each stage.

Reduction in the number of steps:

- The market analysis is unbundled into two steps: the documentation of the overall market demand or “pull,” and the “analysis” of the specific market opportunities to focus the following co-creation. As observed before, a better description of the specific market opportunities will have a positive effect on the engagement of the Danish companies – and will most likely also help the project owners to generate support and resources for the project.
- The “Organize” stage combines the steps of “relationship building” and “organizing and involvement.” As these are two very related “process” activities, it makes very much sense to combine these.
- The co-creation stage is described as in the early model.

- The implementation step is either subsumed in the co-creation step or is no longer seen as a task of the facilitator organization. To the extent that this is a model of “facilitation”, it can make sense to exclude the implementation stage from the model: this is assumed to be done by the involved parties. However, to the extent that CAM is seen as a model of “intervention,” the implementation part may need to be explicitly considered in the model.

#### Closed-loop representation:

- Amplification indeed needs to be represented by a closed-loop or feedback model. This is backed up by the experience of the CLEAN Team in the field and by the theoretical arguments made before.
- The model assumes a “causality” that runs from the “pull” to the “analysis” to the “organization” and the “co-creation”, which leads to more “pull” as more opportunities are unlocked, etc. This is a very logical and elegant representation of the process.
- The circular representation is elegant but It does not make the other interdependencies explicit. For example, better ‘co-creation’ may lead to better ‘organization’ as all parties understand better how to work together. Similarly, better ‘organization’ may help the formulation of specific market opportunities, an activity that takes place in the ‘analyze’ stage. Anyone applying this model will most likely experience these interdependencies, just at the CLEAN Team did. In fact, the CAM in Figure 4 has in the center some dotted lines that refer to these interdependencies. However, for purposes of communication, these interdependencies were not emphasized.
- It is worth noting that a feedback model also can lead to and explain a “competitiveness deceleration.” That is, when the ‘pull’ and ‘analysis’ are not well done, it will have a negative effect on the ‘organization’ as parties will feel that they have wasted time and effort, which will stifle ‘co-creation’ and have a dampening effect on competitiveness.

#### Specific measure of progress:

- To make the model operational in a large number of sectors, it is indeed very useful to define a number of specific measures to track progress. The measures that are provided are specific and meaningful and will help all parties track their progress -- or inform them early on that they are getting into a negative feedback loop and either have to stop or radically change the approach.

- It probably makes sense to add some other measures, such as for example, the number of workshops that have been run compared to the typical number of workshops for that stage, or the number of facilitators – or facilitator hours – that have been used compared to the typical number of facilitators or hours for that stage, etc.

Overall, the model is **elegant** for its simple representation of the activity of competitiveness amplification, **appealing** as it seems applicable to other sectors and countries, and **operational** as it identifies the assumptions that need to be met and the steps to take in each stage.

The model subsumes however the **very critical role of the facilitator** that needs to be omni-present to avoid the development of the “tragedy of the commons.” The field work provided substantial evidence that parties are very often too short-term oriented, that discussions are hampered by information asymmetry, that resources need to be provided to move the organization and co-creation forward, that it is difficult to encourage company leadership in the co-creation stage (and before), etc. In my opinion, the CLEAN Team performed a crucial “amplification” role throughout, and for practical and theoretical reasons, one needs to expect a similar need in other applications. This need is certainly acute in the early years of co-creation, but depending on the momentum of the amplification -- or deceleration – may also be required in later years.

## VI. Discussion and recommendations

**There is no doubt that the vision of the CLEAN leadership was exceptional and that the CLEAN Team did an equally exceptional job to realize the vision.** The project is remarkable:

- It helps to create a short and long term solution for a real competitiveness problem of a class of Danish companies in some sectors
- It helps local authorities outside Denmark obtain complex solutions in a very cost efficient way, and helps the development of local companies where the solutions are co-created
- It does all this in a very resource efficient manner

The leadership and team therefore need to be congratulated for their exceptional effort and results. The observations that follow need to be seen from the point of view of how to make the future work of competitiveness amplification even more impactful. They revolve around 1) the type of other sectors that could benefit from this model; and 2) further research on the factors that may help the process become even more impactful.

### Application of the model to other sectors

The intervention model assumes that there is some degree of “market failure,” a coordination and pricing problem that cannot be solved by the commonly observed forces in markets where buyers and suppliers find each other and where the price mechanism guides transactions between the parties. Market failure is a very common reason for regulatory intervention and it is often found in public goods (e.g. transportation, education, safety, climate, etc .<sup>15</sup> The work of 2009 Nobel price winner Elinor Ostrom showed that market failure can be resolved sometimes by letting a non-market organizations – such as CLEAN – pursue collective action.

As discussed above, there indeed appears to be a market failure phenomenon in some segments in the cleantech sector for a class of Danish companies. To see if other sectors may face the same challenge, the specific sector characteristics need to be kept in mind. The characteristics of the sector and the companies that are focused on are: 1) project based, where local SME’s are at a sizeable disadvantage compared to their large competitors; 2) infrequent transactions / contracts which makes it particularly onerous for SME’s to develop an international marketing infrastructure and international

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<sup>15</sup> See for example Joseph Stiglitz, “Markets, Market Failures and Development”, American Economic Review, 1989.

negotiation skills; 3) risk averse buyers because the projects (e.g. water, energy works) affect many people and need to be operational for a long time, and 4) fragmented demand, which makes it complicated to specialize on one country or sector.

There are many sectors where SME's can do very well and where there is no need for organized competitiveness amplification. Examples include branded consumer goods, consumer services such as traveling and financial services, etc. Market failure is the exception rather than the rule in the economy, and buyers and suppliers find it increasingly easy to transact.

There are however sectors which could benefit very much from the CAM. There is no discussion of this extension in the publication, but examples that come to mind are agriculture at large – food, vegetables, flowers, dairy, etc. It seems that Denmark has a very good reputation for these products. While this claim needs to be examined in much more detail with a solid factual database, it appears that similar structural conditions are in place in these sectors: fragmentation in supply; new, global demand that is not easily reached by the smaller players; and, an opportunity for local co-creation in establishing agricultural enterprises in the new markets.

There also appear to be many opportunities for exporting the CAM to other countries in Europe that face similar competitiveness issues. The Scandinavian countries come to mind, but also several countries of Eastern Europe (e.g. Czech Republic, Poland) which have a local competence base, but face challenges to tap the global growth markets. I believe the learning of the CLEAN Team would be extremely valuable to companies in these countries.

In conclusion, the work of the CLEAN Team and the Competitiveness Amplification Model are not constrained to the cleantech sector. Of course, the cleantech sector in and of itself represents a very substantial market opportunity, as the Global Cleantech Report substantiated. The claim that the model can be extended to other sectors and countries is credible and promising.

#### Fine-tuning the Competitiveness Amplification Model and Impact

I have commented in the previous sections on the practical importance of the work of CLEAN and the theoretical underpinning. Below, I raise a number of issues that are observations and possible avenues for further research or fine-tuning.

- **Company selection.** The paper starts with the assumption that Denmark has many companies in the cleantech sector that are competitive in the segment in which they operate, but nonetheless find themselves stuck, and that these firms can be empowered by collective action / co-creation such as the CLEAN initiative. The report also describes that some firms are more eager contributors than others. In the end, about 20 firms were actively engaged in the 5 co-creation projects that showed most promise.<sup>16</sup> The report mentions that the initial conference gathered about 150 companies and stakeholders (p. 15).<sup>17</sup> It does not discuss how many companies attended and then decided not to participate, or how many participated initially and then stayed away. It is important that the companies that are selected for competitiveness amplification have “global competitiveness **potential**.” While they do not need to master the spectrum of skills that some of the MNC’s in their sector have, they should not be deficient in their specialty. As previous “Competitiveness” research has shown, propping up uncompetitive firms by government or non-government organizations has proven to be unpromising. I believe it is worthwhile to better understand the characteristics of the companies that benefited from the CLEAN initiative. There are 5 companies that are present in two active projects, 15 in just one project each. What is the difference among these companies? Which appear to be the “leader” firms, the “follower” firms, the “lost” firms? Research into the characteristics of the companies that participated in the initiative and that contributed to its success -- and their own success -- will teach us how to be more selective in the same sector in the future, and in other sectors and/or other countries where the CAM is applied.
  
- **Project characteristics.** When starting an initiative such as CLEAN, it speaks for itself that most leads are pursued at the early stage. With hindsight, it is probably possible to identify which CCS projects had a better chance of being successful than the other. Similar to the previous point, it would be very valuable to examine whether the CCS projects can be described along certain characteristics, and whether one can identify which types of projects have a higher chance for taking off.

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<sup>16</sup> From the overview “Status of MOU’s” provided by Neelabh Singh, Head of Strategic Projects, CLEAN

<sup>17</sup> Note that approximately 300 companies were approached to participate in the projects based upon the relevance to the companies. They were approached not only through conferences but also bilaterally or through project focused information sessions or concept notes. Information provided by Neelabh Singh, Head of Strategic Projects, CLEAN

- **Integrated vs. specialized projects.** It is true that SME's have a hard time competing in the market for "complex, integrated solutions" as they do not have the portfolio of technologies, the management skills, nor the international project financing skills to be competitive. There is no discussion in the report whether the Danish SME's were able to offer their "specialized" services in the markets that were targeted, or were discouraged to do so because it did not fit the initiative, or because there was no demand for them. Insisting on "integrated, complex solutions" most likely increases the short term cost for each firm (coordination with other companies, learning, etc.) and may introduce delays, which may erode the short-term benefits. This is likely to reduce active engagement of some companies, ultimately stifling the co-creation. Perhaps there is a "sequencing" of projects, or a particular "mix of integrated and specialized" projects that improves the likelihood of co-creation.
  
- **Critical mass effects.** Social processes such as co-creation are known to be driven by critical mass effects. This is popularly referred to as "confidence in numbers." Risk averse and resource constrained SME's may have a reluctance to engage in the process. We know from other social processes that some firms are more eager to engage early than others, and that signaling of "success" is very important to increase participation. Were some of these effects observed here? What are the characteristics of the "early adopters" who start the process? Which communications / signaling is most effective to generate positive word of mouth and momentum? How can negative word of mouth and momentum be avoided? There is a whole literature dealing with critical mass and network effects that can be tapped to enhance the success of co-creation, and undoubtedly that could also learn from the CLEAN initiative.
  
- **Facilitator actions / behaviors "best practice".** I have argued several times that the facilitator plays an essential role in the process. Most parties are short term oriented and averse to contributing resources to the collective effort. Across the many projects that the CLEAN Team initiated and developed -- or saw unraveling -- there must be some actions / behaviors that the Team has found to be mission critical, and there must be actions / behaviors the Team has learnt to avoid. These process "best practices" are essential if a promising extension to other sectors and / or countries is to be expected. Theoretically, this would be an important contribution to the literature on the development of "common resources" such as trust, reputation and knowledge.

- **Detailed case studies.** While a sizeable amount of research has been conducted on how to avert the tragedy of the commons in agriculture (fisheries, irrigations, deforestation, etc.), there is a dearth of research on business settings. The CLEAN initiative is very original, interesting and promising in its potential to be applied to other sectors and countries. It would be very interesting to write several competitiveness case studies on co-creation in the Danish cleantech sector. European competitiveness is a very important policy issue today and for a long time to come, and these studies would be interesting to academics, governments and businesses.

In conclusion, The CLEAN initiative was visionary and very important to companies and countries alike, was very well executed, and is rich in practical and theoretical learnings. The observations in this section highlight some of the promising avenues for future extension and research. I believe that an extension of the work is very much merited from a practical and theoretical perspective, and would bring much deserved acclaim to the sponsors and originators of the initiative.

## VII. Abbreviations

<b>CAM</b>	Competitiveness Amplification Model
<b>CCS</b>	Complex Cleantech Solutions
<b>JIT</b>	Just in Time
<b>MNC</b>	Multinational Corporation
<b>MOU</b>	Memorandum of Understanding
<b>TQC</b>	Total Quality Control
<b>SME</b>	Small and Medium Enterprise



## Karel Cool

The BP Chaired Professor of European Competitiveness  
Professor of Strategic Management

Karel Cool's research, teaching and consulting focus on problems of industry dynamics and competitive strategy (e. g. competitive positioning; assessment of profit opportunities in markets; strategic supply chain dynamics and management; eco-system leadership; vertical integration and de-integration; industry overcapacity; critical mass races, customer value creation and capturing).

He has published in many journals, including Management Science, the Strategic Management Journal, Harvard Business Review, Organization Science, Academy of Management Journal, Marketing Letters, Advances in Strategic Management, Journal of Supply Chain Management, etc, edited the books, European Industrial Restructuring in the 1990s, 1992 (with D. Neven and I. Walter; Macmillan 1992), and Industry Structuring and Restructuring (with J. Henderson and R. Abate; Blackwell 2004, SMS Book Series), and has contributed to many books on competitive strategy.

From 1995 till 2007, he was Associate Editor of the Strategic Management Journal, the leading strategy journal. He has consulted on major strategic problems of corporate and industry restructuring and worked with a variety of corporations, including Unilever, PriceWaterhouseCoopers, Daimler-Chrysler, Borealis, RollsRoyce, Thomson Travel Group, Exxon, Solvay, Novo-Nordisk Lufthansa, KBC, Whirlpool, IBM, Expedia, Banque de France, McKinsey, Starwood, BCG, Shell, ING, Aktiva, Amgen, Bayer, Nordea, World Economic Forum, IBM, Reynaers, KGL Kuwait, Hearst, etc.

During the academic year 1995/6 he was Visiting Professor at the Graduate School of Business at the University of Chicago. He has also been Visiting Professor at Northwestern University and was co-chair of the 2002 annual Strategic Management Society Conference held in Paris.

He won 6 times the “Best Teaching Award” in the MBA Insead Programme and is the Founder and Director of the long running Competitive Strategy executive program at INSEAD in Fontainebleau and Singapore. In 2007, he was inducted as Fellow of the Strategic Management Society. In 2009, he received by Purdue University the George S. Day Distinguished Alumni Academic Service Award.

In September 2014, he was honored by the Case Center as one of the best selling case authors over the past forty years: Karel has (co-) authored more than sixty case studies.

Karel Cool obtained his PhD (1985) and MScIA (1982) from Purdue University and his MA (1981) and Lic (1978) in Applied Economics from the University of Antwerp (UFSIA).