Using an Evolutionary Learning Laboratory approach to establish a World First Model for Integrated Governance of Haiphong, Vietnam[‡]

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Abstract

We manage the systems we are part of in a highly compartmentalised structure. Government departments are a typical example of how society operates in silos. However, complex political, environmental, socio-economic, and business-financial issues tend to transcend the jurisdictions and capacities of any single government department, which adds significantly to the difficulties in finding systemic management solutions and effective governance plans. This lack of cross-sectoral communication and collaboration in complex national and global environments compromises the leaders and policy makers in government, leading to centralised protocols and siloed departments that undercut local responsiveness. The Government of Haiphong City (HPC) decided to establish an Evolutionary Learning Laboratory (ELLab) to enhance communication and collaboration between the different departments in order to develop an integrated and systemic Governance Plan for HPC.

Workshops and specialist forums were held to gather the mental models of representatives of different Government departments. The "learning" process started with integrating the various mental models into a systems structure using Causal Loop Modelling and continued during the steps of interpreting and exploring the model. A deeper understanding of the potential implications of actions, strategies and policies lead to the identification of leverages and systemic interventions that will contribute to the development of a sustainable HPC.

A series of Bayesian Belief Network (BBN) management models is developed for each of the identified systemic interventions, determining the requirements for their implementation, the factors that could affect the expected outcomes; and the order in which activities should be carried out to ensure cost-effectiveness and maximum impact. The models are combined and used to develop a refined systems model, which forms at the same time a systemic strategic and operational plan for integrated governance of HPC.

Keywords systems thinking; sustainable development; complex problems; management models; Ecological Cities as Economic Cities (Eco2 Cities); ELLab

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INTRODUCTION

Issues and challenges related to sustainability are multiple and complex in nature involving decision makers, scientists, NGOs and other stakeholders. These problems and challenges cannot be addressed and solved in isolation and along single dimensions. Collaborative, systemic, and integrated approaches are essential to deliver desired and sustainable outcomes. It is crucially important for decision makers, managers, and local people working in various sustainability domains to be equipped with the necessary capacities and skills to manage their respective domain sustainably.

Lack of cross-sectoral communication and collaboration is a common complaint in government and business, because decisions are dominantly made within single departments and sectors of business. There are seminars, retreats and courses that focus on finding solutions and entire books have been written on these problems (Harris 2007; Helbing 2007; Donald 2010; Espinosa 2011; Gharajedaghi 2011). However, little has been done that is new or has proved able to overcome the barrier to communication caused by differing mental models of the world and the fact that we mostly operate in "silos".

This lack of cross-sectoral communication and collaboration in complex national and global environments compromises the leaders and policy makers in government, leading to centralised protocols and siloed departments that undercut local responsiveness. The systems model of the Cat Ba Biosphere Reserve (CBBR), that is situated within Haiphong City (Province) that was developed with managers of the biosphere pointed out that all components of the system are highly interconnected. This led to a realisation in HPC that complex problems cannot be solved in isolation, and that individual departments cannot develop governance policies without integrating their different planning and operational strategies. The Government decided to establish an Evolutionary Learning Laboratory (ELLab) for HPC to enhance communication and collaboration between the different departments in order to develop an integrated and systemic Governance Plan for HPC. The ELLab is a generic process to address any complex issue, regardless of its nature, through the creation of a platform for continuous "learning by doing" by all involved and has proven to be an innovative and effective approach for unravelling and managing complex multi-dimensional issues (Bosch, Nguyen et al. 2013).

Workshops and specialist forums were held to gather the mental models of representatives of different Government departments. The "learning" process started with integrating the various mental models into a systems structure using Causal Loop Modeling and continued during the steps of interpreting and exploring the model. A deeper understanding of the potential implications of actions, strategies and policies lead to the identification of leverages and systemic interventions that will contribute to the development of a sustainable HPC.

A series of Bayesian Belief Network (BBN) models is developed for each of the identified systemic interventions, determining the requirements for their implementation, the factors that could affect the expected outcomes; and the order in which activities should be carried out to ensure cost-effectiveness and maximum impact. The models are combined and used to develop a refined systems model, which forms at the same time a systemic strategic and operational plan for integrated governance of HPC.

Once the systemic interventions have been identified and the integrated operational plan has been completed, the management strategies and/or policies that will create the biggest impact

will be implemented. As no systems model can ever be completely 'correct' in a complex and uncertain world and unintended consequences will always occur, the final step consists of a reflection of the successes and failures of the integrated systemic interventions. This step is regarded as the most valuable opportunity for co-learning (between all different government departments) on how to deal with complexity. Not only do the outcomes bring new insights and serve as an impetus for innovation, but discussing these is helping to further enhance the understanding of each other's mental models towards the development of shared understanding and goals and improving cross-sectoral communication and collaboration. These are all leading to new levels of learning and enhanced management performance in the different departments of the HPC government as a whole. Strategies may need refinement or a complete change may be required that will lead to refining the model, identifying new knowledge requirements and the ELLab cycle starts to repeat itself.

This paper discusses the application of an ELLab approach to develop a series of management models for dealing with sustainable issues in Haiphong City and to use these to develop an integrated, cross sectoral strategic development plan for the City as a whole. Such a systemic plan and governance of a City as a whole will be a major challenge, but if successful, be a world first.

BACKGROUND

The development of this research project is based on the following basics:

- The long-term collaboration between Haiphong City (The Office of the Communist Party, Haiphong People's Committee (HPPC), Cat Ba Biosphere Reserve Office) and the Systems Design and Complexity Management Alliance, University of Adelaide Business School (lead by Professor Ockie Bosch – formerly from the University of Queensland).
- Since 2008 Prof Ockie Bosch and his research team have worked with various people involved in the management of the Cat Ba Biosphere Reserve. HP and CB have contributed a lot of resources to the 'CBBR Learning Laboratory' Pilot Project. Prof Bosch's side has also contributed significantly to the CBBR project (for example, approximately AU$200,000 for salaries of researchers and postgraduate students, travel costs between Australia and Haiphong; AU$ 170,000 for people from HP in the Australian Leadership Award Fellowship training program in Australia in 2008).
- Outcomes and agreements in the meeting, dated 14 June 2010, between HPPC (represented by Dr Nguyen Van Thanh, former Chairman of HPPC) and Prof Ockie Bosch.
- The Acceptance Letter, dated 11 August 2011, from the International Society for the Systems Sciences (ISSS) to an offer from Haiphong City to host the 57th World Conference of the ISSS in Haiphong in July 2013.
- Document No. 1359/BNG-VP from the Vietnamese Ministry of Foreign Affairs, dated 24 April 2012, for holding the 57th World Conference of the ISSS in July 2013 in Haiphong, Viet Nam.

- Decision No. 623/QĐ-UBND from the HPPC, dated 9 May 2012, for the establishment of the National Organising Committee and the Assistant Secretariat for the 57th World Conference of the ISSS in Haiphong in July 2013.
- Outcomes of Prof Ockie Bosch and Dr Nam Nguyen's working visit in Haiphong in August 2011 (especially the first Workshop with representatives from different Departments and Offices to identify the drivers and barriers for the sustainable development of HPC – Workshop co-chaired by Prof Dan Duc Hiep and Prof Ockie Bosch, 24 August 2011).
- Outcomes of Prof Ockie Bosch and Dr Nam Nguyen's working visits in Haiphong and Catba in August 2012 (especially the Seminar to introduce the Ecopolicy program to representative from different Departments and Offices and teachers from universities and high schools in HPC – Seminar co-chaired by Prof Dan Duc Hiep and Prof Ockie Bosch in Haiphong, 22 August 2012; and the Workshops with relevant stakeholders – Workshops co-chaired by Dr Nguyen Van Thanh and Prof Ockie Bosch on Catba, 23 August 2012).
- Outcomes of Prof Ockie Bosch and Dr Nam Nguyen's working visit in Haiphong in December 2012 (especially the Workshops with representatives from different Departments and Offices – Workshops co-chaired by Dr Nguyen Van Thanh and Prof Ockie Bosch, 13-14 December 2012; and the Training of the Ecopolicy program for teachers from universities and high schools in HPC – Training provided by Dr Nam Nguyen and Prof Ockie Bosch, 17 December 2012).
- Outcomes of Prof Ockie Bosch and Dr Nam Nguyen's working visit in Haiphong in March 2013 (especially the Workshop with representatives from different Departments and Offices – Workshop co-chaired by Prof Dan Duc Hiep and Prof Ockie Bosch, 19 March 2013; and the successful implementation of the Ecopolicy program in various universities and high schools in HPC – leading to the successful Final Ecopolicy Competition in HPC, 14 May 2013 and the on-going implementation of the 2nd Phase of Ecopolicy program in HPC).
- Outcomes of Prof Ockie Bosch and Dr Nam Nguyen's working visit in Haiphong in June 2013 (especially the Meeting between IOC, LOC and HP Ecopolicy Committee – Meeting co-chaired by Prof Dan Duc Hiep and Prof Ockie Bosch, 10 June 2013).

The Evolutionary Learning Laboratory process and approach have been established in several countries including Vietnam (Cat Ba Island), Cambodia, China and Australia (Keegan and Nguyen 2011; Nguyen, Bosch et al. 2011; Bosch, Nguyen et al. 2013; Nguyen and Bosch 2013). A major outcome of the research in Vietnam has been the identification by the people in the country themselves that a problem in a specific area, e.g. agriculture or tourism, cannot be addressed by a single Government Department. Achieving solutions to complex issues in all cases requires the inputs from various other Departments and stakeholders. Figure 1 demonstrates the involvement and necessary interaction of various different sectors and areas of interest in addressing the issue of managing the Cat Ba Biosphere Reserve sustainably.

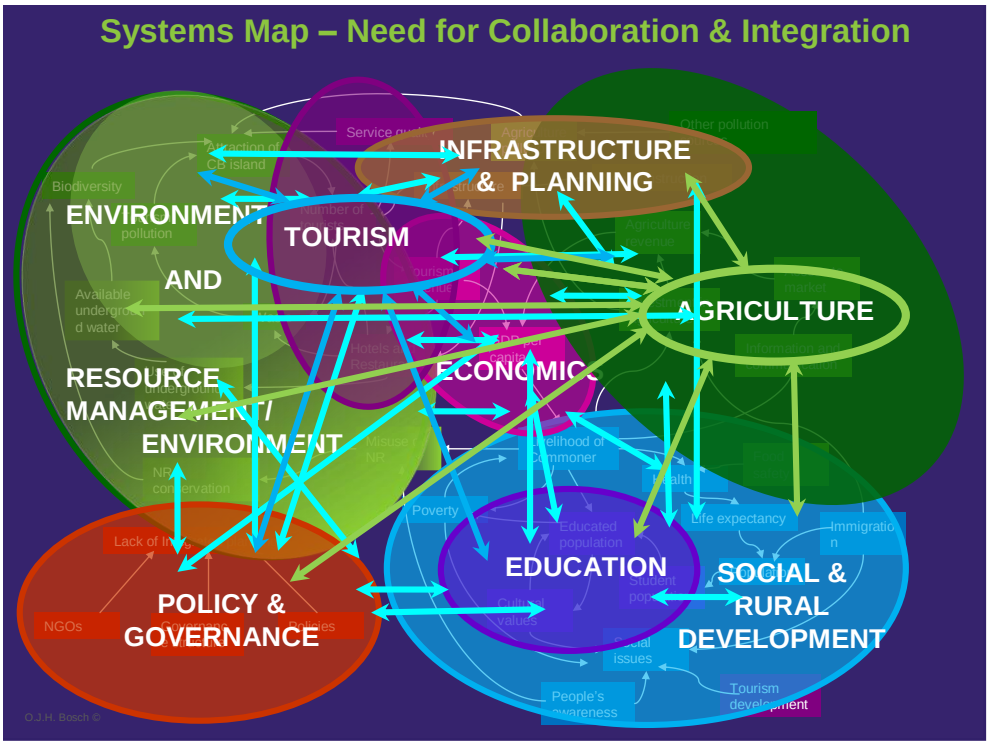

Figure 1: Systems Model of CBBR – A Need for Cross Sectoral Collaboration and Communication

This systems model clearly demonstrates that in seeking solutions for managing the CBBR sustainably, various areas of interests are involved and are interacting with each other. This served as the impetus for the Government of Haiphong City, Vietnam (where the CBBR is located) to develop an Integrated Master Plan for the governance of the whole city (administratively, Haiphong City is equivalent to a province or a state), by using systems approaches to identify the necessary links and needs for effective collaboration.

The nature of the concept of cross-sectoral collaboration and communication is diagrammatically presented in Figure 2. As can be seen from the left part of the figure, each Department or organisation is usually separated from each other by 'thick concrete' walls. They would have their own plans and strategies to achieve a particular goal. However, many of these plans could also help another organisation to achieve some of their goals. For example, the social leverage points identified in the Cat Ba system are all strongly related to each other. If one takes 'Poverty alleviation', there were various points made in the stakeholder workshops in Cat Ba that relate to either acknowledging the importance of poverty alleviation, or why poverty is a problem (lack of job skills to work in the hospitality sector and in that way share in the revenue of the tourism boom; disease; lack of knowledge to utilise the resources; lack of land and irrigation systems). Several groups came up with ideas that could help to reduce poverty and these ideas cannot be carried out by one particular Department or organisation.

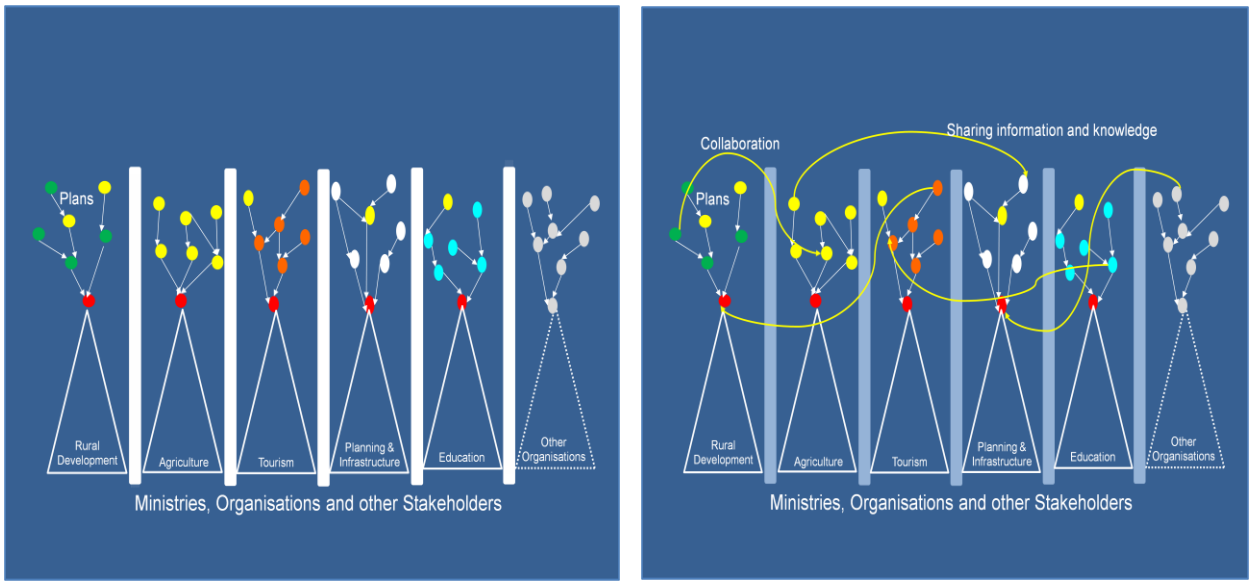

Figure 2: A Framework for Cross Sectoral Collaboration and Communication

RESEARCH APPROACH

SYSTEMS THINKING

Although systems thinking is an 'old' concept (Midgley 2003) it is increasingly being regarded as a '*new way of thinking*' to understand and manage complex problems at both local or global levels (Bosch, King et al. 2007; Cabrera, Colosi et al. 2008). Maani and Cavana (2007) use the analogy of an iceberg to illustrate the conceptual model known as the Four Levels of Thinking (Figure 3) as a framework for systemic interventions.

In this model, events or symptoms (those issues that are easily identifiable) represent only the visible part of the iceberg above the waterline. Most decisions and interventions currently take place at this level, because 'quick fixes' (treating the symptoms) appear to be the easiest way out, although they do not provide long lasting solutions. However, at the deeper (fourth) level of thinking that hardly ever comes to the surface are the '*mental models of individuals and organisations that influence why things work the way they do. Mental models reflect the beliefs, values and assumptions that we personally hold, and they underlie our reasons for doing things the way we do*' (Maani and Cavana 2007, p.15).

Moving to the third level of thinking is a critical step towards understanding how these mental models can be integrated in a systems structure that reveals how the different components are interconnected and affect one another. Thus, systemic structures unravel the intricate lace of relationships in complex systems.

The second level of thinking is to explore and identify the patterns that become apparent when a larger set of events (or data points) become linked to create a 'history' of past behaviours or

outcomes and to quantify or qualify the relationships between the components of the system as a whole.

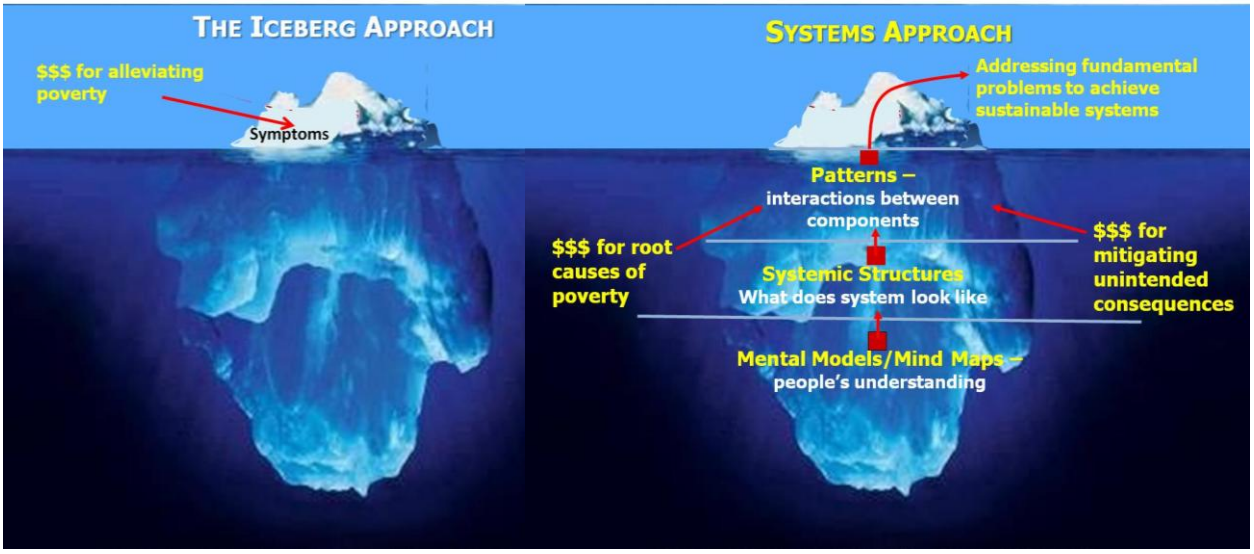

Figure 3: The Iceberg Approach versus a Systems Approach

Source: (Bosch, Nguyen et al. 2013)

The systems thinking paradigm and methodology embrace these four levels of thinking by moving decision-makers and stakeholders from the event level to deeper levels of thinking and providing a systemic framework to deal with complex problems (Maani and Cavana 2007).

The application of systems thinking has grown extensively and encompasses work in many diverse fields and disciplines such as, to mention but a few, management (Jackson 2003), business (Sterman 2000; Walker, Stanton et al. 2009), decision making and consensus building (Maani and Maharraj 2004), human resource management (Quatro, Waldman et al. 2007), organisational learning (Galanakis 2006), health (Newell 2003; Lee 2009), commodity systems (Sawin, Hamilton et al. 2003), agricultural production systems (Wilson 2004), natural resource management (Allison and Hobbs 2006), environmental conflict management (Elias 2008), education (Hung 2008), social theory and management (Mingers 2006), food security and population policy (Keegan and Nguyen 2011), sustainable development (Smith 2011; Nguyen and Bosch 2013). The following section demonstrates how a comprehensive systems thinking approach, embedded in a cyclic Evolutionary Learning Laboratory (ELLab) framework, can be used to deal effectively with complex issues in a variety of contexts.

THE SYSTEMS-BASED EVOLUTIONARY LEARNING LABORATORY METHODOLOGY

The Evolutionary Learning Laboratory (ELLab) methodology/approach used in this research consists of a radical approach to enhance cross-sectoral communication and collaboration, to deal with increasing complexity and to promote effective change at local and global levels

(Nguyen, Bosch et al. 2011; Bosch, Nguyen et al. 2013). An environment is created in which a diverse group of participants engage in a cyclical process of thinking, planning, action and reflection for collective learning over time on how to deal with complex issues. The ultimate goal is to achieve coherent actions across different sectors towards sustainable outcomes.

The concept of the ELLab is based on the familiar, but often misapplied and misunderstood, concept of Action Learning (after 50 years emerging as an important area of research into ways of managing wicked problems). Its key elements are that the stakeholders in a problem tackle real tasks and issues, learn with and from one another about the issues, take responsibility and support one another in their decision making and actually implement the solutions and plans after much reflection. Drawing on this idea, an ELLab consist of a unique seven step iterative process (Figure 4) of thinking and acting in which the participants engage in well defined activities, creating an environment where policy makers, managers, local facilitators, members of the community and researchers collaborate and learn together in an 'experimenting laboratory' to understand and address complex multidimensional and multi-stakeholder problems of common interest in a systemic way (Nguyen, Bosch et al. 2011; Bosch, Nguyen et al. 2013).

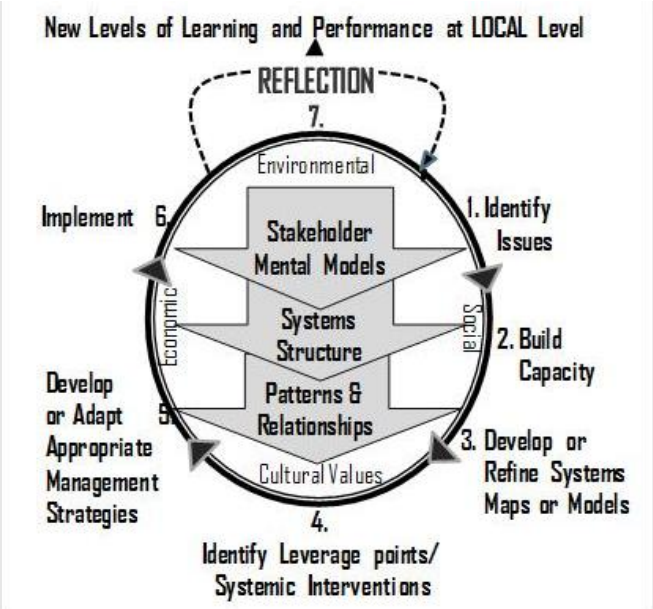

Figure 4: Evolutionary Learning Laboratory for Managing Complex Issues

Source: (Bosch, Nguyen et al. 2013)

Although it builds on evolutionary design principles as described in the work of Banathy (1996) and the concept of evolutionary leadership developed by Laszlo (2001), the process of establishing an ELLab (Figure 4) could be regarded as a unique "methodology" to collaboratively integrate and use existing and future knowledge to help manage complex issues. It starts at the 'Fourth level of thinking' with an **issues workshop** (**step 1**) and a series of forums with specialist groups to gather the mental models of all stakeholders involved in the issue under

consideration, their perceptions of how the system works, what they regard as barriers to success and drivers of the system and possible strategies (solutions) to overcome these problems.

This is followed by implementing the 'Third level of thinking' through follow-up **capacity building (step 2)** sessions during which the participants (all stakeholders) learn how to integrate the various mental models into a **systems structure (step 3)**. The Vensim software program (Systems 2011) is a valuable tool for the development of a systems model (Causal Loop Diagram) of the issue under consideration. This learning step is of particular importance in order for all involved to take 'ownership' of the systems model.

Once completed, the participants move to the 'Second level of thinking' by interpreting and exploring the model for patterns, how different components of the model are interconnected and what feedback loops, reinforcing loops and balancing loops exist. This step aims to assist relevant stakeholders to develop an understanding of their interdependencies and the role and responsibility of each stakeholder group in the entire system. The main barriers and drivers of the system are discussed in more detail, which provides the stakeholders with an opportunity to develop a deeper understanding of the implications of coordinated actions, strategies and policies. Overall, this process provides all stakeholders with a better understanding of each other's mental models and the development of a shared understanding of the issue(s) under consideration.

The interpretation leads to the **identification of leverage points for systemic intervention (step 4**). Leverage points are places within a complex system (e.g. an economy, a living body, a city, an ecosystem) '*where a small shift in one thing can produce big changes in everything ... leverage points are points of power*' (Meadows 1999, p.1). Senge (2006, p.64) also refers to leverage points as the '*right places in a system where small, well-focused actions can sometimes produce significant, enduring improvements*'. Identification of leverage points greatly assists the devising of systemic interventions (finding systems based solutions) that will contribute to the achievement of goals or solving problems in the system under consideration.

The outcomes are used to develop a refined systems model, which forms at the same time an **Integrated Master Plan (step 5**) with systemically defined goals and strategies (systemic interventions). In order to operationalise the master plan, Bayesian Belief Network (BBN) modelling (Cain, Batchelor et al. 1999; Smith, Felderhof et al. 2007) is used to determine the requirements for implementation of the management strategies; the factors that could affect the expected outcomes; and the order in which activities should be carried out to ensure cost-effectiveness and to maximize impact.

The process of developing good policies and investment decisions is based on the best knowledge (scientific data and information, experiential knowledge, expert opinions) that is available at any point in time. The systems model can be used to test the possible outcomes of different systemic interventions by observing what will happen to the system as a whole when a particular strategy or combination of strategies is implemented, that is before any time or money is invested in actual implementation.

Once the systemic interventions have been identified and an operational plan has been developed, the next step for the people who are responsible for the different areas of

management is to **implement the strategies and/or policies (step 6)** that will create the biggest impact. Targets are determined and monitoring programs are implemented to measure and/or observe the outcomes of the strategies and policies. In many cases it only requires an adjustment of existing monitoring programs to comply with the targets set within the ELLab process (e.g. to include factors to be measured that were used in the construction of the Bayesian Management Model).

Because no systems model can ever be completely 'correct' in a complex and uncertain world and unintended consequences always occur, the only way to manage complexity is by **reflecting (step 7)** at regular intervals on the outcomes of the actions and decisions that have been taken to determine how successful or unsuccessful the interventions are and to identify unintended consequences and new barriers that were previously unforeseen.

This integrated model will be embedded in a cyclic process, in which people will implement the governance strategies and policies, reflect and discuss the outcomes and change where and if required over time. This process will establish Haiphong as an Evolutionary Learning Laboratory for sustainable development and management of complex issues – which will be a "World First".

APPLICATION AND DISCUSSION

1. Identify issues – Step 1 of the ELLab

An initial workshop was held in HPC (24 August 2011) to identify the drivers and barriers towards the sustainable development of HPC. The workshop was attended by 30 participants (Figure 5) representing all the relevant Departments and Offices in HPC. The preliminary results of this workshop are included a recent report (Nguyen, Bosch et al. 2013).

Figure 5: Participants at the 'issues workshop' for the HP ELLab Project

2. Build capacity – Step 2 of the ELLab

A seminar was conducted (22 August 2012) to introduce relevant stakeholders to the key concepts of systems thinking, ELLab approach and the art of interconnected thinking in the Ecopolicy program (Figure 6). Capacity building will remain an ongoing process, because of the involvement of stakeholders in subsequent activities during the BBN Management modelling workshops (step 5 of the ELLab), as well as in future activities. In this way the capacities of stakeholders in understanding and applying the systems thinking concepts and tools used in this project will be further developed, which will play an important role in them taking ownership of the models and approach.

In addition, as part of the Cat Ba Biosphere Reserve ELLab project, a two-month systems thinking and associated capacity building program was conducted in Australia (October and November 2008) for a group of ten policy makers, managers, and technical officers from different levels of government, across sections of agencies in HPC (the ALA Fellows). The process and outcomes of this capacity building program have been reported in a recent paper (Nguyen, Graham et al. 2012)

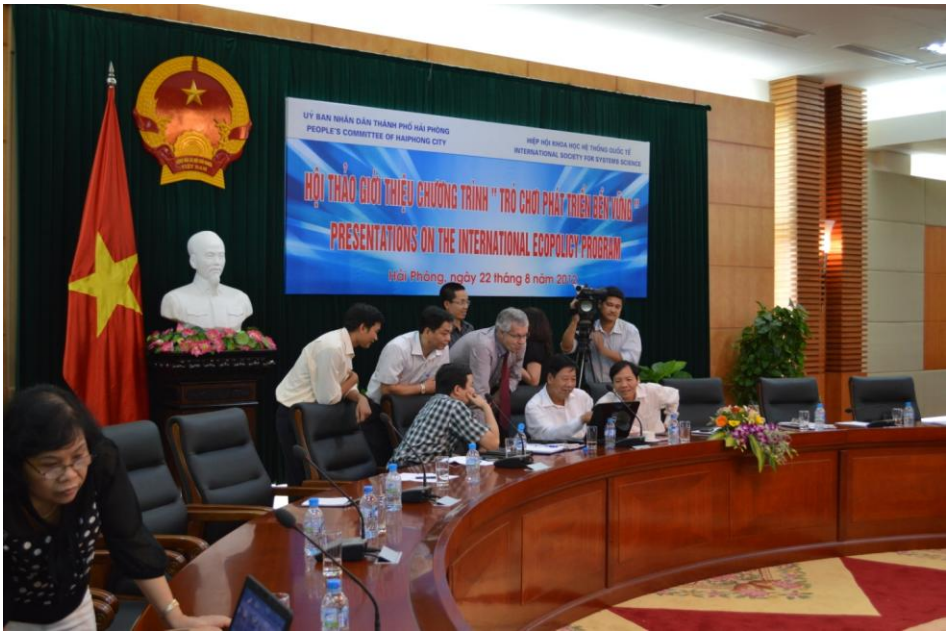

Figure 6: Seminar introducing Systems Thinking and Ecopolicy program to stakeholders in HPC

3. Develop systems model – Step 3 of the ELLab

Based on the information and preliminary results from step 1 above, casual loop modelling (Sherwood 2002; Maani and Cavana 2007) was used to develop a draft systems model (Figure 7) of key issues related to the sustainable development of HPC.

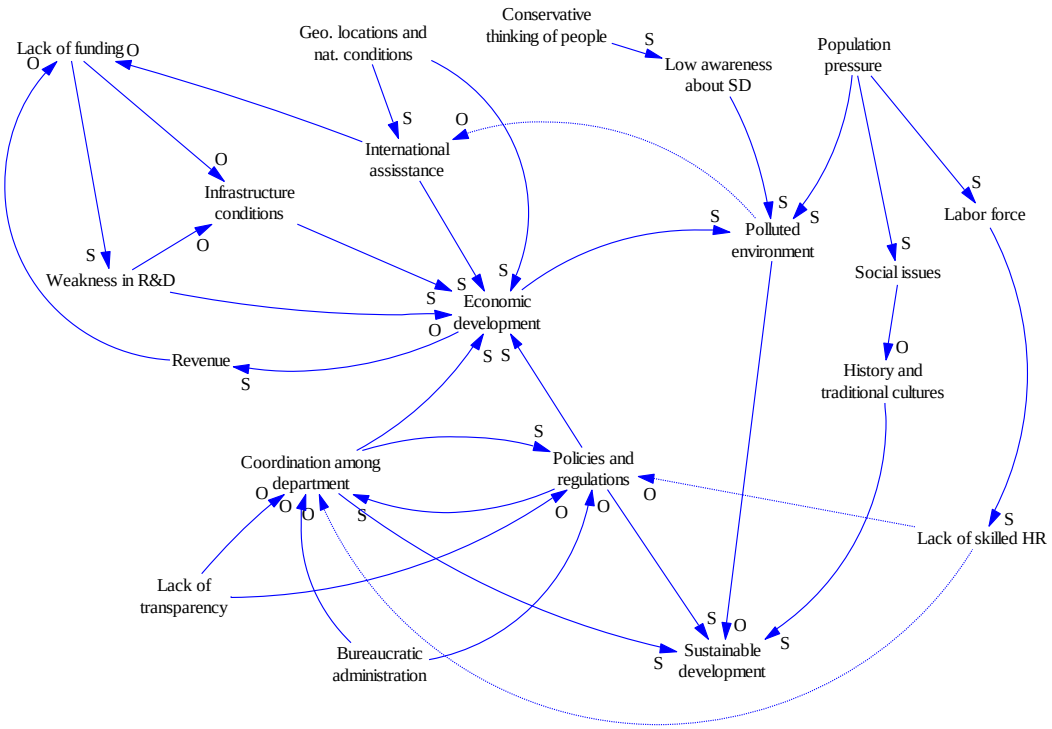

Figure 7: Draft Systems Model of HPC

4. Identify leverage points and systemic interventions – Step 4 of the ELLab

Leverage points are places within a complex system (e.g. a corporation, an economy, a living body, a city, an ecosystem) '*where a small shift in one thing can produce big changes in everything ... leverage points are points of power*' (Meadows 1999, p.1). Senge (2006, p.64) pointed out that leverage points are the '*right places in a system where small, well-focused actions can sometimes produce significant, enduring improvements*'.

Leverage points exist in all systems. For example, the economy of any country is a truly complex social system. Interest rate is one of the most obvious leverage points in the economy where a small change in interest rate can have large effects on the whole socio-economic system. Education is another example. It has been widely acknowledged that education is the key leverage point to alleviate poverty in the underdeveloped and developing countries. In biological systems, the practice of acupuncture is a good example to demonstrate the concept of leverage points. The acupuncturist would usually find the 'right spots' or leverage points, on the body of a patient to insert the needles. This would gradually cure the problem experienced by the patient in various parts of the body that have been targeted (Nguyen and Bosch 2013).

A series of workshops (e.g. Figure 8) and discussions in HPC (August and December 2012) led to the identification of five key leverage points for the sustainable development of HPC. These include sustainable economic development, sustainable environmental management,

improvement of people's livelihoods, enhancement of inter-sectoral collaboration and 'starting with the young'.

Figure 8: One of the workshops conducted to identify the leverage points for the HP Project

5. Develop management strategies – Step 5 of the ELLab

Bayesian Belief Network (BBN) management decision models have been developed for four out of the five identified leverage points in the Haiphong Project. The last identified leverage point ('starting with the young') has been addressed by the introduction of the cybernetic simulation Ecopolicy program (see below). It is important to note that **the following BBN models are preliminary models**. Further work and data are required to validate and refine these models.

BBN management model for sustainable economic development of HPC

A workshop was conducted in Haiphong (13 December 2012) to develop a BBN management model for the sustainable economic development of HPC. More than 30 participants from all relevant Departments and Offices in HPC attended the workshop. The preliminary results of the workshop can be found in (Nguyen, Bosch et al. 2013).

Bayesian Belief Network (BBN) modeling (Cain, Batchelor et al. 1999; Smith, Felderhof et al. 2007) was used to develop a management model for the sustainable economic development of HPC. The BBN model (Figure 9) determines the requirements for implementation of the

management strategies; the factors that could affect the expected outcomes; and the order in which activities should be carried out to ensure cost-effectiveness and to maximize impact.

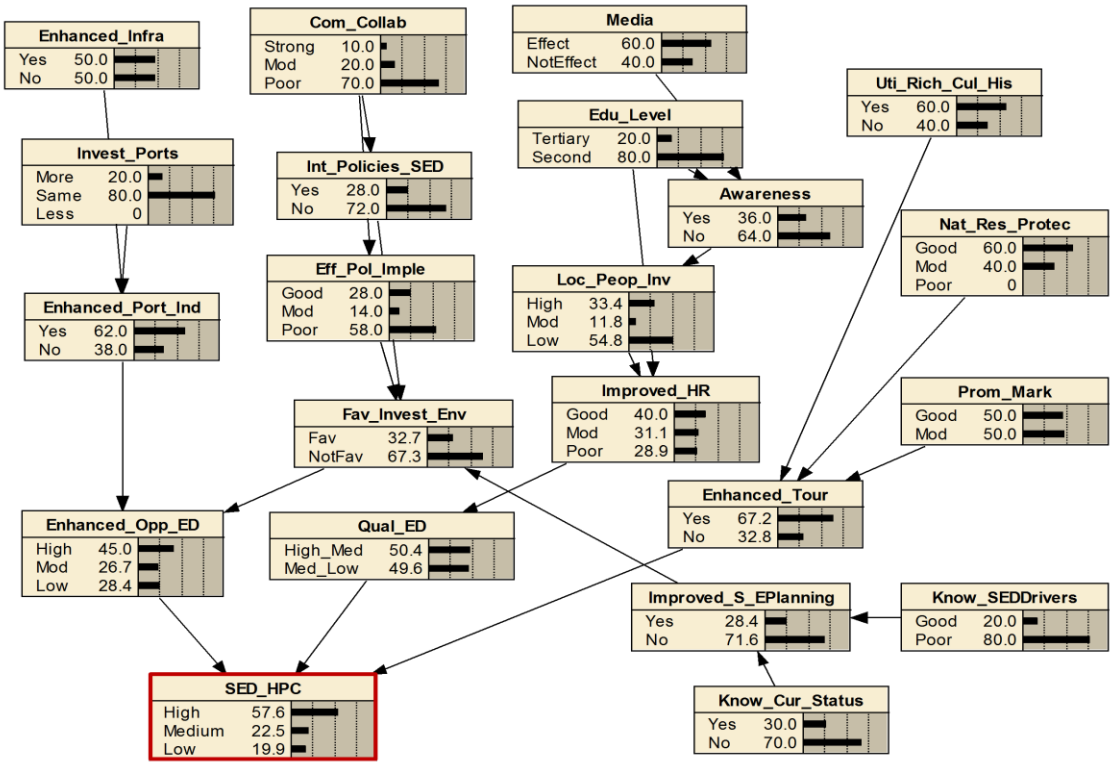

Figure 9: Preliminary BBN model for SED of HPC – current conditions

The sustainable economic development of HPC is influenced by four main groups of factors, including 'infrastructure', 'policy and collaboration', 'education' and 'tourism'. According to the preliminary BBN model (Figure 9), under the current conditions, the probability for sustainable economic development of HPC to be high is 57.6%.

By testing different scenarios, a combination of systemic interventions or management strategies could be carried out to increase the probability for a high SED of HPC. These include 'enhanced infrastructure', more 'investment in ports', strong 'communication and collaboration', higher 'education level', increased 'awareness', good 'protection of natural resources', good 'promotion and marketing' and a favourable 'investment environment' (Figure 10).

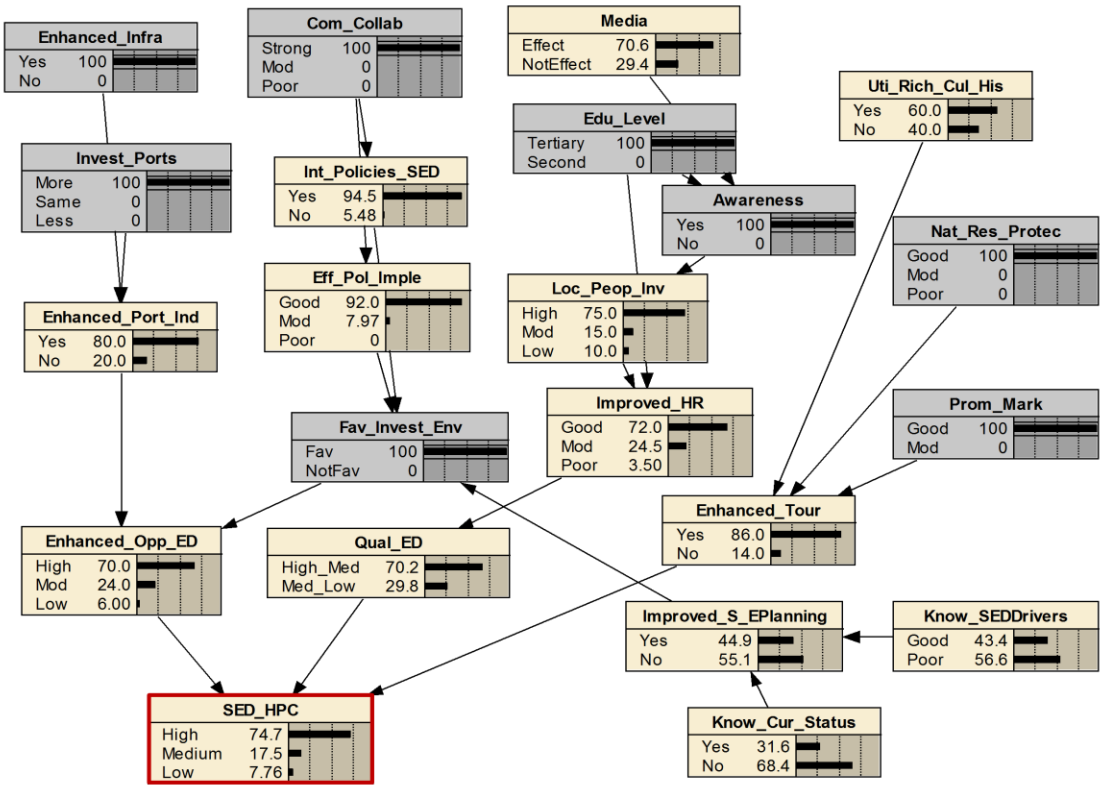

Figure 10: Preliminary BBN model for SED of HPC – systemic interventions

BBN management model for improving livelihoods of people in HPC

A workshop was conducted in Haiphong (14 December 2012) to develop a BBN management model for improving livelihoods of people in HPC. 38 participants from all relevant Departments and Offices in HPC attended the workshop. The preliminary results of the workshop can be found in (Nguyen, Bosch et al. 2013).

Similarly, Bayesian Belief Network (BBN) modeling (Cain, Batchelor et al. 1999; Smith, Felderhof et al. 2007) was used to develop a preliminary management model for improving livelihoods of people in HPC (Figure 11).

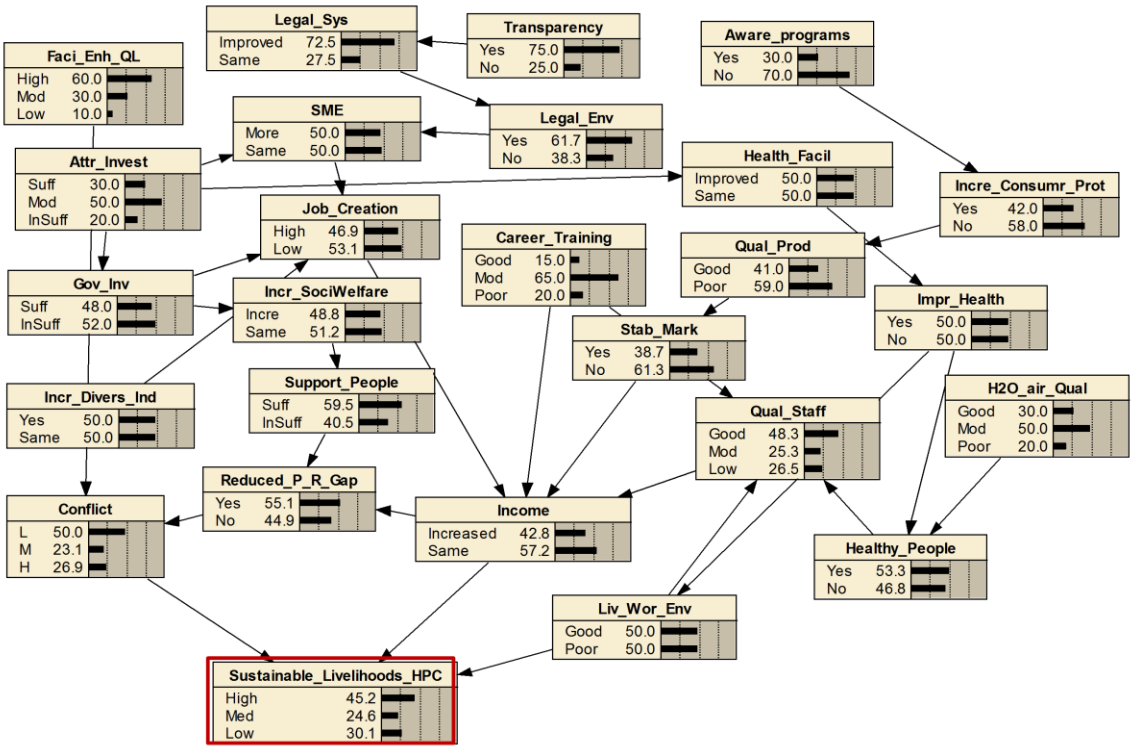

Figure 11: Preliminary BBN model for SLP in HPC – current conditions

The sustainable livelihoods of people (SLP) in HPC is influenced by various factors, ranging from 'facilities to enhance quality of life' to 'social welfare', 'stable market', 'consumer protection' and 'living and working environment'. According to the preliminary BBN model (Figure 11), under the current conditions, the probability for sustainable livelihoods of people in HPC to be high is 45.2%.

By testing different scenarios, a combination of systemic interventions or management strategies could be carried out to increase the probability for a high SLP in HPC. These include more 'facilities to enhance quality of life', increased 'awareness programs', good 'career training', improved 'health facilities' and good 'quality staff' (Figure 12).

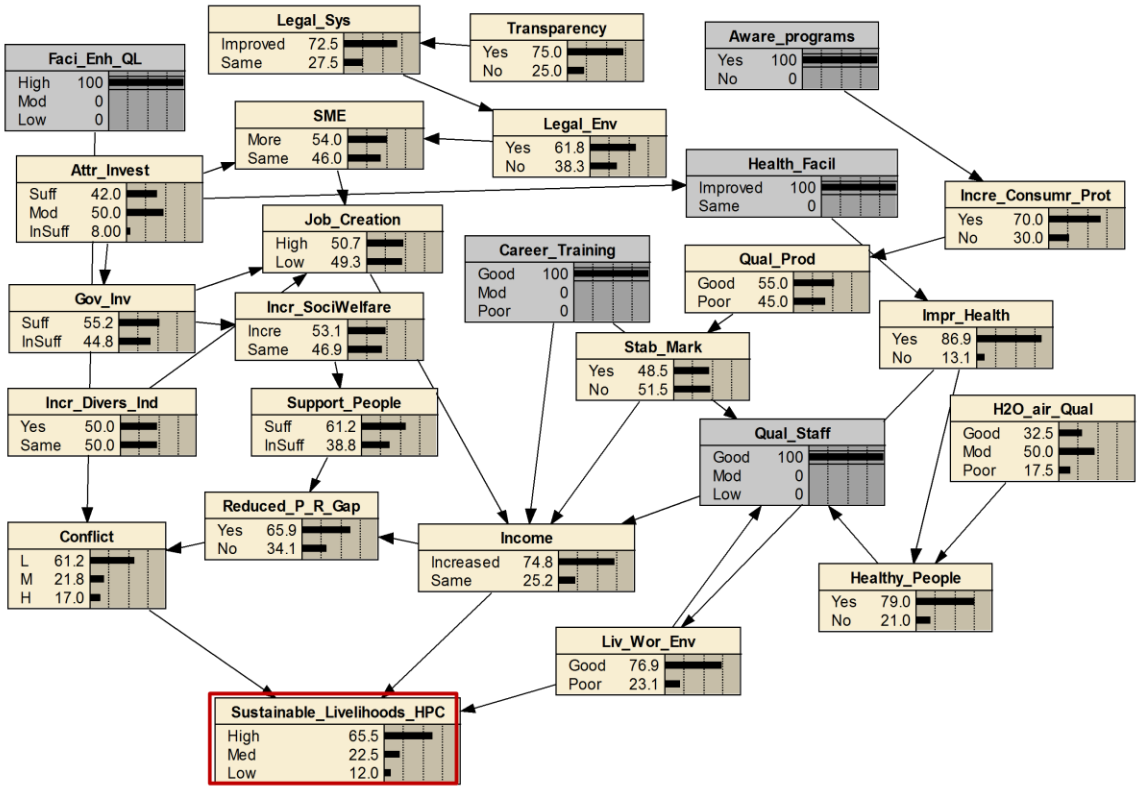

Figure 12: Preliminary BBN model for SLP in HPC – systemic interventions

BBN management model for sustainable environmental management in HPC

A workshop was conducted in Haiphong (19 March 2013) to develop a BBN management model for sustainable environmental management in HPC. 35 participants from all relevant Departments and Offices in HPC attended the workshop. The preliminary results of the workshop can be found in (Nguyen, Bosch et al. 2013).

Bayesian Belief Network (BBN) modeling (Cain, Batchelor et al. 1999; Smith, Felderhof et al. 2007) was used to develop a preliminary management model for sustainable environmental management in HPC (Figure 13).

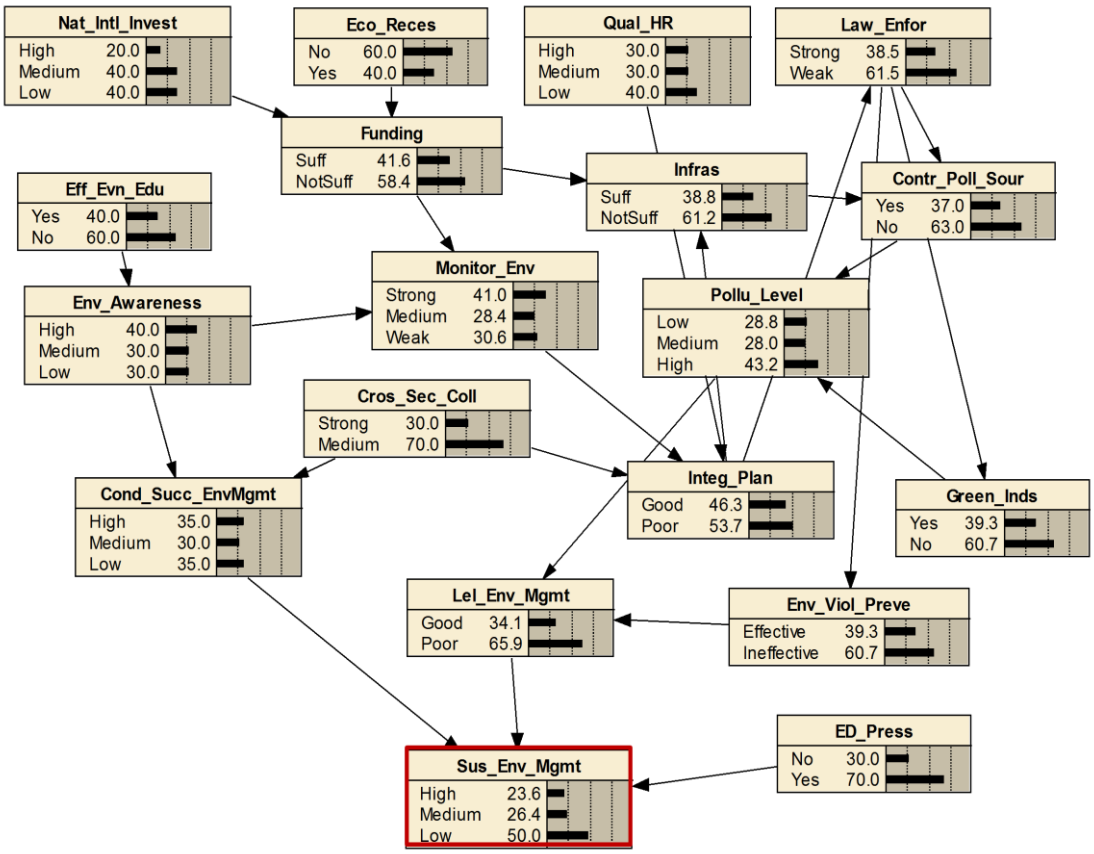

Figure 13: Preliminary BBN model for SEM in HPC – current conditions

The sustainable environmental management of HPC is influenced by a number of factors. For example, level of 'national and international investments', 'quality of human resources', 'law enforcement', 'control of pollution sources', 'economic development pressure', etc. According to the preliminary BBN model (Figure 13), under the current conditions, the probability for sustainable environmental management in HPC to be high is only 23.6%.

By testing different scenarios, a combination of systemic interventions or management strategies could be carried out to increase the probability for a high SEM in HPC. These include strong 'law enforcement', 'effective environment education', strong 'cross sectoral collaboration', more 'green industries', effective 'prevention of environment violations' and reduced 'economic development pressure' (Figure 14).

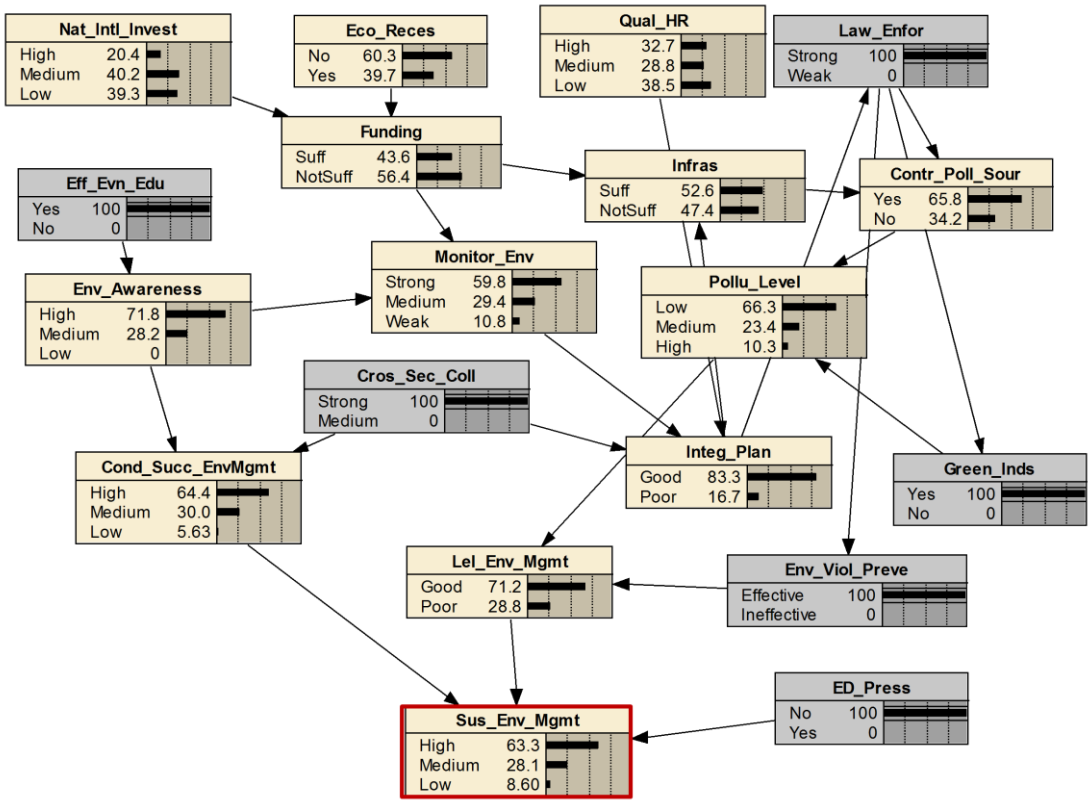

Figure 14: Preliminary BBN model for SEM in HPC – systemic interventions

Management model for enhancing inter-sectoral collaboration in HPC

The above preliminary BBN models will be refined and their associated management strategies will be integrated (combined) into in a management model for enhancing inter-sectoral collaboration in HPC (Figure 15). This management model indicates how the different departments, businesses and others will need to continue to communicate and collaborate with each other in order to solve the complex issues systemically. The combined model will also serve as a basis to develop an Integrated Plan for Systemic Governance, which can be used to test different policy scenarios and to identify the leverage points where investments will have the biggest effects – We believe a World First!

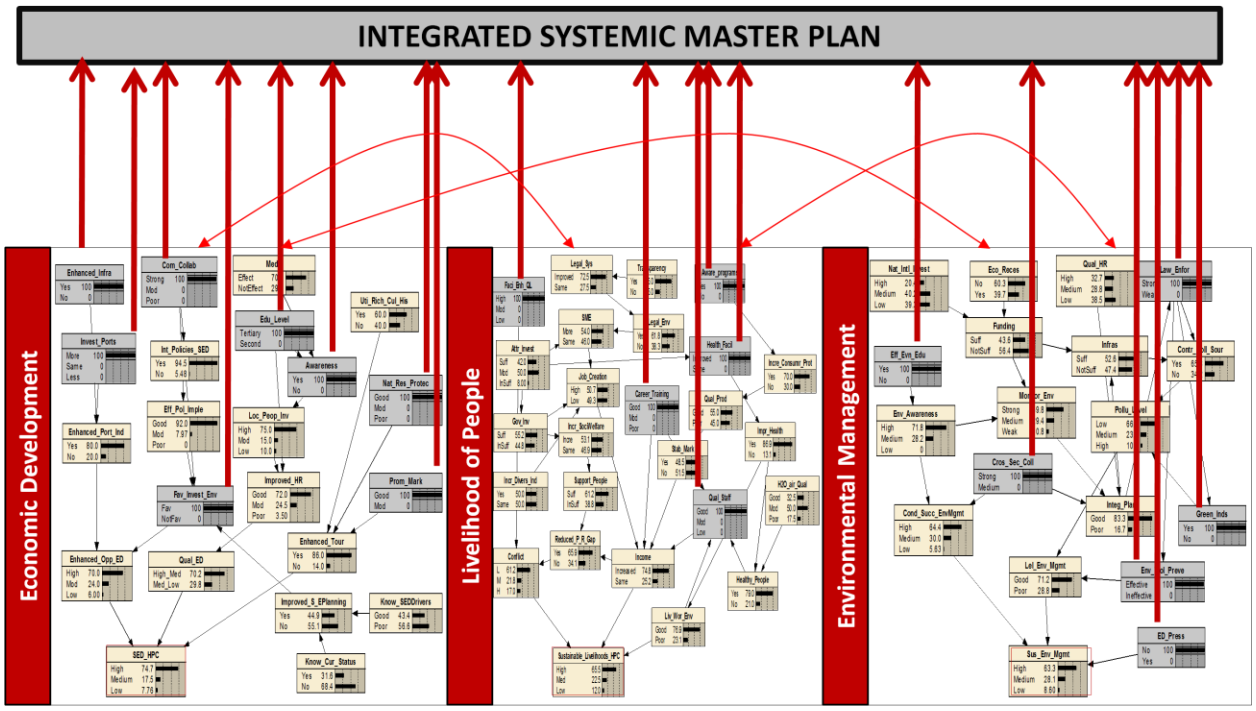

Figure 15: Preliminary management model for integrating the systemic interventions and actions to enhance inter-sectoral collaboration in HPC

Ecopolicy program – First introduction in Vietnam

Government and business institutions are under pressure to make the right investment decisions in the face of a continually changing world. Policy makers, managers and leaders today are expected to deliver innovative solutions to cope with increasing change and uncertainty. Despite many efforts to deal with these complex issues facing our society the solutions so far have been seldom long lasting. In order to govern our complex society towards resilient technical, economical and social developments there is an urgent need to step outside our collective 'comfort zone' and to develop new ways of thinking and acting in the interest of our future. It is essential for current and future managers and leaders to be equipped with new ways of thinking that are systems design-led to deal with complex problems in a systemic, integrated and collaborative fashion – that is, working together in identifying and dealing with root causes of issues rather than focusing on short-term fixes.

"Starting with the young" is a major leverage point to address this difficult problem and gaming is part of the culture or language that talks to young people. With these as departure points the simulation game (Ecopolicy) introduces young people to the concepts of systems and interconnected thinking. The Ecopolicy Simulation Game was introduced and explained during a workshop in Haiphong (August 2012) that was attended by representatives from Government, schools and Universities in Haiphong. It was demonstrated how students learn through playing the computer simulation game, how to shift from our traditional, mainly linear, simple cause-effect thinking approaches to a new way of thinking in relations, in feedback cycles, in patterns,

in networks, in systems. Most important, the game is fun, with illustrations, animations and music leading to a strong emotional engagement with the message of the game (Bosch, Nguyen et al. 2013).

A follow-on Ecopolicy seminar (Figure 16) was conducted in December 2012 to provide the necessary training for some of the Government officials and teachers from 4 universities and 18 selected high schools in HPC. Subsequently, Ecopolicy program was successfully implemented in HPC – Phase 1 of Ecopolicy program.

Figure 16: Ecopolicy training seminar for officials and teachers in HPC

6. Implement the management strategies – Step 6 of the ELLab

The refined BBN management models and their associated management strategies will be embedded in a cyclic process, in which people will implement the governance strategies and policies, reflect and discuss the outcomes and change where and if required over time. This process will establish Haiphong as an Evolutionary Learning Laboratory (Figure 17) for sustainable development and management of complex issues – which will be a "World First". The process is illustrated in the following diagram:

ELLab for Integrated Governance of HPC

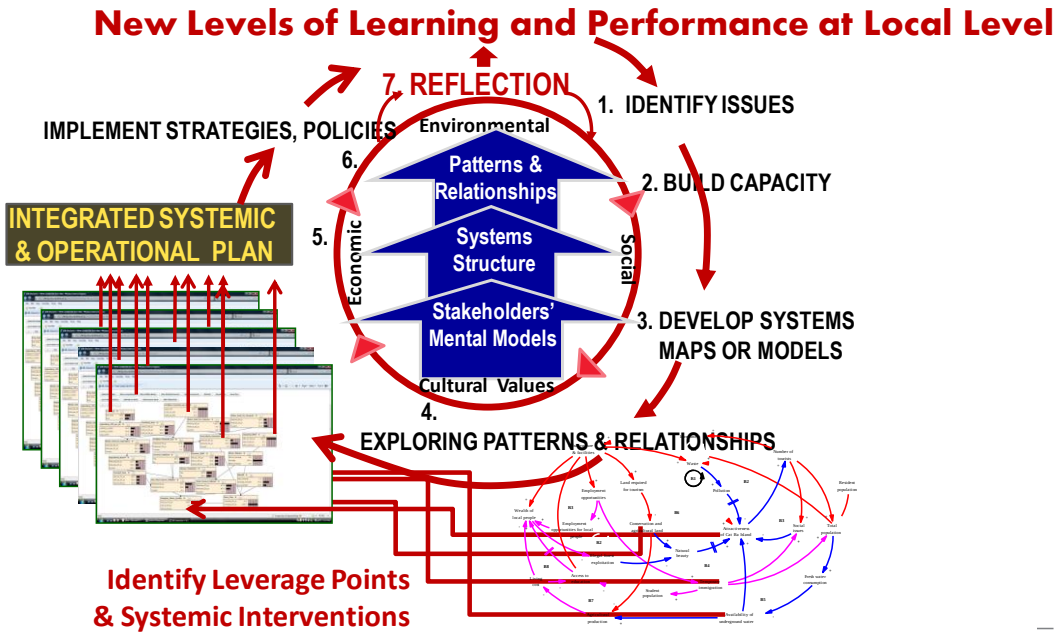

Figure 17: Haiphong ELLab Framework

Implementation of one of the identified leverage points ('starting with the young') – Phase 1 of Ecopolicy program in HPC

A group of High schools and Universities in Haiphong was the first in Vietnam to take part in a series of competitions to learn about interconnected thinking. The competitions were run within schools and Universities in several rounds between small teams within classes and between classes, until a winning team for each school and university was determined.

The final competition was organised (14 May 2013) as an "Ecopolicyade" when all the winning teams from each school and University competing against each other in the presence of invited guests from all walks of life - managers and decision makers in Government, companies, businesses and organisations. The eight winning teams represented Haiphong at the 57th World Conference of the ISSS 2013 to compete in the first International Ecopolicyade against the two best teams from Adelaide, Australia (Figure 18). At this event, the teams were able to obtain advice from a world audience of systems scientists and representatives of international Governments, large companies and organisations – a truly inter-generational and inter-cultural co-learning experience for all involved on how to deal with the complex issues facing our world.

Figure 18: Winning teams at the first International Ecopolicyade

7. Reflect on the implemented strategies – Step 7 of the ELLab

The reaction to Phase 1 of Ecopolicy program in HPC has been highly successful. Ecopolicy has been received as an revolutionary new learning tool for "Starting with the Young" to create future leaders that will appreciate the interconnectedness of different components of any system and to take this into account in facing the many difficult issues that are facing their society in a 21st century knowledge society. The Department of Education and Training in Haiphong has decided to consider incorporating Ecopolicy into school and entry year university curricula.

Reflection on the success of Phase 1 has led to Phase 2 of Ecopolicy that is currently being planned. This will first involve the extension of the Ecopolicy program to all high schools and universities in Haiphong, followed by extending the program nationwide. All Government officials in Haiphong also have to implement Ecopolicy in order to raise their awareness of the importance of systems and interconnected thinking, to avoid quick fixes through linear thinking and to learn how systemic solutions to any problem need to be long lasting and sustainable.

Actions will also be carried out to implement the management strategies (which will be identified from the refined BBN management models).

CONCLUSION

This paper reports on an extensive multi-year research program by the Systems Design and Complexity Management (SDCM) Alliance, The University of Adelaide Business School (the

research team was previously from The University of Queensland), using systems thinking and modelling as research paradigm and methodology for theoretical and practical foundation of the Evolutionary Learning Laboratory for addressing complex issues. We concur with Ishwaran et al. (2008) that documenting and disseminating such case studies are an important part of the work to be undertaken as part of the Evolutionary Learning Laboratories focus.

The Haiphong ELLab Project and CBBR Pilot Project have so far produced five scientific journal papers (Nguyen, Bosch et al. 2011; Nguyen, Graham et al. 2012; Bosch, Nguyen et al. 2013; Bosch, Nguyen et al. 2013; Nguyen and Bosch 2013), a PhD Thesis (Mai 2012), and various presentations at International Conferences.

- One full cycle of the HP ELLab has been completed (Ecopolicy program)
- The BBN models will be refined and management strategies will be implemented
- ELLab is an excellent systems based "methodology" to unravel complexity and over time, through cross-sectoral communication and collaboration, find ways to achieve sustainable development in the complex environments we are dealing with in a turbulent 21st century knowledge society

Systems thinking and the systems based ELLab approach can change the effectiveness of government departments, businesses, organisations and communities in many ways:

- Better mutual understanding of the diverse mental models of different stakeholders
- Moving away from traditional linear thinking that leads to quick fixes and treatment of the symptoms, to long lasting systemic solutions that address the root causes
- Ability to collaboratively identify leverage points and systemic interventions to underpin systems-based master and strategic plans
- Deep understanding of the interconnectedness between possible actions in order to develop efficient and cost-effective management strategies
- Working knowledge of cutting edge systems tools to test the outcomes of strategies, including identification of unintended consequences – before actual implementation
- Ability to use back-casting to identify those factors that will have the most influence on the achievement of goals (knowing where and when to invest in the system)
- Using the ELLab as an ongoing process for continuous co-learning and refinement of management strategies

The Haiphong ELLab project is on-going and further progress will be reported.

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