Sirkka Heinonen and Nicolas Balcom Raleigh

CONTINUOUS TRANSFORMATION AND NEO-CARBON ENERGY SCENARIOS

NEO CARBON ENERGY

FINLAND FUTURES RESEARCH CENTRE

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Cover photo by Sirkka Heinonen. Transformed urban space in Milan, a pop-up farm surrounded by EXPO2015 pavilion structures and the historic Sforza Castle.

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"Panta rhei"

Heraclitus

(c. 535–475 BCE)

CONTENTS

PREFACE

Students taking **the Continuous Transformation Course** (2 ECTS) organized by me in **the Creative Sustainability Master's Degree Programme** at Aalto University participated in **a Futures Clinique** on "Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds" on 22nd May 2015.

Professor Sirkka Heinonen from Finland Futures Research Centre (FFRC), University of Turku, was invited as a visiting lecturer to introduce core concepts of Futures Studies and conduct a Futures Clinique, specifically tailor-made for the course. **The Continuous Transformations Course** focuses on the mechanisms of social change and suggestions for sustainable ways of living based on different futures scenarios.

The contribution of this Futures Clinique, its lectures and exercises, were a considerable input to the course. The students were able to learn about the whole field of futures studies, its framework, approaches, principles, methods and actors. What was of equal importance, was the possibility to apply foresight methods onto material of ongoing foresight research carried out at Finland Futures Research Centre for the "Neo-Carbon Energy" project. This was a rewarding and enlightening example of educational co-operation between Aalto University and Finland Futures Research Centre, University of Turku.

Helsinki 26th July 2015

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ABSTRACT

This report describes the process and results of Futures Clinique held 22nd May 2015 at Aalto University. At the Futures Clinique – titled ***Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds*** – students of Continuous Transformation Course elaborated four tentative scenarios of an on-going Tekes-funded project called Neo-Carbon Energy. The goal of the research project is to explore futures based on renewable energy system. The report begins by describing the method, project, and the theoretical framework. This is followed by the description of the process and results of the Futures Clinique. The nature of change and transformation is also discussed. Working in four groups, the participants focused on a chosen scenario through a multi-staged process. As the report is given to the participants for feedback as well as for further discussion and development, comments on the results are also presented. The conclusive chapter presents observations on transformation and futures learning.

1. INTRODUCTION

This report presents the results of a Futures Clinique conducted on 22nd May 2015 at Aalto University. The students at the **Continuous Transformation Course** (2 ECTS) organized by Tiina Laurila in the **Creative Sustainability Programme** participated in a Futures Clinique on **Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds** at Aalto University. The participants were from 12 different countries. Following a lecture on introducing Futures Studies and the Neo-Carbon Energy project, Professor Sirkka Heinonen from Finland Futures Research Centre (FFRC), University of Turku, moderated a Futures Clinique with the students.

The introduction of this report presents the concept of Futures Clinique (ch 1.1) and provides information on the Neo-Carbon Energy project (ch 1.2) where the scenarios used as material in the Futures Clinique have been constructed. Reflections on the thesis of the Third Industrial Revolution (TIR) according to Rifkin (2012; 2014) (ch 1.3) and analysis of the concept of "transformation" (ch 1.4) are also made as introductory discussion before presentation of the Futures Clinique results.

The so-called industrialised societies are all moving either in the shorter or longer term towards a post-industrial order, characterised by services replacing more and more of productive activities. However, Veltz (2015) does not perceive industry as being supplanted by tertiary activities. He rather foresees the emergence of a hyper-industrial model that combines industrial production with service activities, based largely on digital technology and networked organisation. This is similar to Rifkin's (2014) notion of services in combination to the decentralized and digitalized production model of industry. Portnoff (2015) also underlines the surge of technical, social and organisational innovations that are prompted by the explosion of digital technology. This has changed the landscape by opening up new perspectives for production to companies that are able to adapt to this development. Veltz (2015) highlights the new industrial question from the following four angles: 1) time and space (a world of hubs and networks, with enterprises between hyper-distribution and hyper-concentration; 2) sources of performance (rise of transactional relations, but a need for interpersonal relations and trust, too); 3) forms of competition (the growing role of fixed costs and investment in design, access to networks, infrastructure etc); and 4) modalities of organisation (increasing recourse to project teams and service provision). The emergence of such a hyper-industrialised society symbolises an opportunity, while at the same time contains the risk of hyper-polarisation between high-powered decision-making at production centres and more specialised, sub-contracting territories. Innovation, security and solidarity should be developed as combined in order to reduce such a risk.

1.1 On Futures Cliniques

Futures workshops are frequently used brainstorming tools in the field of futures studies, originally introduced and developed by Robert Jungk to proceed in several stages (Nurmela 2013). A general goal of a futures workshop is to tackle a chosen topic in an interactive way with participants of various background.

The Futures Clinique is a specially structured futures workshop developed and tested at Finland Futures Research Centre (FFRC) on various occasions as well as within a methodological development process. It is designed to explore and promote especially radically alternative and **transformational futures**, using several foresight methods and tools, i.e. Futures Window, Futures Wheel, Futures Table, identification and impact analysis of weak signals and black swans, as well as scenario narratives. Also, various creativity techniques are utilized in order to complement the use of foresight methods with a creative approach. Futures Clinique can be described as a participatory and exploratory futures workshop process to **tackle uncertainties, identify disruptions and generate innovations**. As a method, Futures Clinique is designed to answer the challenges posed by the world that is in a state of constant flux with bottom-up initiatives (Heinonen & Ruotsalainen 2013b).

According to Roy Amara (1981), there are three main facets when exploring the futures: possible, probable, and preferred futures. There has, however, been a shift towards paying attention also on the impossible, improbable, and unpreferred futures. Next to preferred and possible futures, Clinique aims to anticipate also the unexpected and impossible events and ways of development. Evoking alternative and radical futures broadens the futures horizon, and helps to see beyond the evident possibilities. (Heinonen & Ruotsalainen 2013b; Heinonen 2014)

Futures Clinique aims at 1) promoting futures thinking (see more in ch 1.4), futures preparedness and provocative futures dialogue, and at 2) harnessing collaborative creativity for insights, innovative ideas and practical solutions to the selected futures topics. Futures Cliniques can be organised as single-standing events or as a series of several dynamically interconnected workshops.

As a major characteristic Futures Cliniques proceed through three main stages: 1) preparatory work and material, 2) actual workshop, and 3) the subsequent documenting phase, including feedback. The Clinique itself consists of joint sessions for all participants in the beginning and in the concluding part of the event, as well as several working sessions in multi-stakeholder group.

For the Futures Clinique as a process and a methodological framework, see a more detailed account in Heinonen & Ruotsalainen 2013b.

1.2 On Neo-Carbon Energy Project

The Futures Clinique on this course was especially tailor-made for the occasion and utilized research material from an on-going Tekes project called **Neo-Carbon Energy**. The four scenarios tentatively constructed in the project are intended to be elaborated on various occasions, Futures Cliniques and other events. The names of the different scenarios are "**Radical Startups**", "**Value-Driven Techemoths**", "**Green DIY Engineers**" and "**New Consciousness**". Dator (2009; 2012) has proposed that all the scenarios ever made, existing, and forthcoming fall into one of the following four categories: Growth, Collapse, Discipline, and Transformation. In this research project all of the four scenarios are intentionally constructed to go into the category of Transformation. This is part of the "futures provocation", an attempt to seriously discuss possible but radically different futures images and scenarios. See the scenario sketches in Appendix 1 and more on the project at respective websites.[1] Also see a recent Futures Clinique report using the scenarios on another occasion (Heinonen et al. 2015; Heinonen 2015).[2]

The Neo-Carbon Energy Project is financed by Tekes new strategic openings, and the scenarios are based on the futures-oriented work package of the project. Our foresight part is called **"Neo-Carbon Enabling Neo-Growth Society – Transformative Energy Futures 2050"** and it is led by Professor Sirkka Heinonen at Finland Futures Research Centre (FFRC). The Neo-Carbon Energy project is conducted at Finland Futures Research Centre (FFRC), University of Turku in co-operation with VTT (coordinator) and Lappeenranta University of Technology LUT. The research group at FFRC further comprises two project researchers: Juho Ruotsalainen and Joni Karjalainen who are engaged in scenario construction (see Appendix), as well as three students from Master's Degree Programme in Futures Studies who interned at FFRC Helsinki Office during the summer and fall of 2015, Nicolas Balcom Raleigh and Marjukka Parkkinen, and the summer of 2014, Amos Taylor.

The concept of the Futures Clinique is very applicable to working with the scenario sketches of an ongoing research project – in this case the Neo-Carbon Energy project. A Futures Clinique can be utilized as a learning platform and process in university programmes or as brainstorming to fertilize any R&D/policy-making developments and goals.[3] A Futures Clinique can also be used to support devel-

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[1] https://www.utu.fi/en/units/ffrc/research/projects/energy/Pages/neo-fore.aspx and www.neocarbonenergy.fi.

[2] See also a blog post at http://www.sitra.fi/en/blog/carbon-neutral-industry/new-ideas-towards-novel-energy-system-sparked-futures-clinique

[3] A Futures Clinique on Third Industrial Revolution and elaborating the Neo-Carbon Energy scenario sketches was conducted on 6th May 2015 at Sitra. See briefly http://www.sitra.fi/en/blog/carbon-neutral-industry/new-ideas-for-novel-energy-system-sparked-futures-clinique. See a demonstration video at https://sites.google.com/site/futuremediac/videos--presentations

oping a new research agenda as was done for example for the Academy of Finland for their new energy research programme work (Heinonen & Ruotsalainen 2013).

Nicolas Balcom Raleigh has digitized the artefacts of the work groups in the Futures Clinique presented in this report and conducted some initial research into new ideas generated by the groups. Commenting on the work of the students was also done as back office work within the whole project team at FFRC Helsinki Office. The results of the "***Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds"*** Futures Clinique are documented in this report which is given as feedback to the student participants, kept as an example of such an event, as a model for similar exercises and open to further discussion and development as part of the Neo-Carbon Energy project.

The main objective of this futures-orientated part of the project is to study possible socio-economic futures related to the Neo-Carbon Energy system. A core question is: What kinds of societal – economic, cultural, political and lifestyles-related – changes does the Neo-Carbon Energy system promote and enable? Emphasis will be on **citizen-perspectives** and **desired, preferred and transformational futures**. In addition, attention will be paid on how Finnish businesses could utilize these changes and what kind of Neo-Carbon Energy-based innovations might arise.

The core idea in the Neo-Carbon Energy project is the following "formula": Wind + Solar + Storage as synthetic hydrocarbons (often referred to as Power-to-Gas or Power-to-X) enables a distributed energy system (see Breyer 2015; Breyer et al. 2015). The starting point for the envisioned energy system is a novel way of carbon thinking – therefore the expression "Neo-Carbon".

Energy is produced mainly using wind and solar power – energy sources that are cost-effective, emission-free and available for all. Carbon dioxide collected from the atmosphere and hydrogen produced by renewable energy are then used as feedstock for chemicals, fuels and materials. Industrially, these raw materials can already be used to produce all the products known to us. Wide-scale energy storage has been addressed by using synthetic fuels, such as synthetic natural gas, for use in the event of sunless and windless periods, to overcome the problem of intermittency (i.e. the fact that the sun does not always shine and the wind does not always blow). The manufactured fuels, chemicals and materials are identical in composition to those produced from oil, and they can be shared for industrial or consumer use, or be used instantly, for example as vehicle fuel.

The potential products and services from Neo-Carbon Energy framework are to be probed within the project and in collaboration with interested stakeholders. The applications and potential is reflected on Finnish industry, but also with a view to case countries and regions such as China, Argentina, Africa (South Africa, Kenya and Tanzania) and Australia.

1.3 On Third Industrial Revolution

The Neo-Carbon Energy project also investigates and promotes a peer-to-peer, grassroots society and the Third Industrial Revolution (TIR), in which production (energy, services, products) shifts from large factories to small, peer-to-peer units (see e.g. Rifkin 2011; 2012; 2014).

Figure 1. The Third Industrial Revolution combines many emerging trends.

The third industrial revolution, as defined by Jeremy Rifkin (2011), states that a fundamental **socio-economic change occurs when new communication technologies converge with new energy technologies**. The first industrial revolution (late 18th century) was fuelled by the steam engine and the printing press, and the second industrial revolution (early 20th century) by oil, electricity, telegraph and telephone. According to Rifkin (ibid.), the third industrial revolution is now being paved by renewables, such as solar and wind, and the internet.

Contrary to the previous technologies, both renewables and the internet are distributed technologies. Renewable energies are found everywhere instead of certain areas. They are also relatively cheap to exploit. Internet is a networked communication technology without control centres and with low communication costs. Thus, the third industrial production paradigm promotes a decentralized society. In the third industrial phase, the household and communal level will be the main area of production, as citizens produce goods, services and energy by themselves, utilizing digital production technologies, such as 3D-printers, and distributed renewable energy resources. Surplus energy is fed

onto the "energy internet" or "enernet" (smart grid).[4] Citizens and micro-businesses use the internet to organize their productive efforts, and societal and economic power is redistributed from large organisations to small-scale actors.

The relevance of the third industrial revolution for Neo-Carbon Energy is that locally produced and consumed energy affects not only the energy sector, but also the whole of society. Neo-Carbon energy system could provide the energy building block for the third industrial revolution society, in which energy, goods and services are produced locally and small-scale.

The five pillars of Third Industrial Revolution according to Rifkin (2011) are:

1. Shifting to renewable energy
2. Transforming the building stock of every continent into green micro-power plants to collect renewable energies on-site
3. Deploying hydrogen and other storage technologies in every building and throughout the infrastructure to store intermittent energies
4. Using Internet technology to transform power grid of every continent into an energy internet that acts just like the Internet (when millions of buildings are generating a small amount of renewable energy locally, on-site, they can sell surplus green electricity back to the grid and share it with their continental neighbours)
5. Transitioning the transport fleet to electric plug-in and fuel cell vehicles on a smart, continental, interactive power grid.

Portnoff (2015) sees industrial transformation as both a cultural and an organisational challenge that confronts industrial companies today and he stresses the crucial role of human factor in facing the challenge. According to him, the profile of the "factory of the future" should be more collaborative, nimbler, better optimized for new materials, and prepared to utilise robotics, the cloud and cyber-physical systems etc. A genuine "smart" industrial revolution will be based on participatory methods inspired by value-analysis models in order to track the path of innovation with success.

Currently, there's also a discussion on the fourth industrial revolution, resting on the following nine pillars: big data and analytics; autonomous robots; simulation; horizontal and vertical system integration; Industrial Internet of Things; cybersecurity; the Cloud; additive manufacturing; Augmented Reality.[5] The term Industry 4.0 derives from a project in the high-tech strategy of German gov-

[4] According to MIT Technology Review (May 2015) the U.S. government and businesses have committed more than $9 billion to fund smart-grid projects, through grants from the 2009 stimulus legislation. The goal to support the smart grid development is to upgrade the aging electricity infrastructure so that it is better adapted to the intermittency of renewable energy sources and people can use energy more efficiently.

[5] https://www.bcgperspectives.com/content/articles/engineered_products_project_business_industry_40_future_productivity_growth_manufacturing_industries/?chapter=2

ernment promoting computerisation of manufacturing. Industry 4.0 is a collective term embracing technologies and concepts of value chain organization' which draws together Cyber-Physical Systems, the Internet of Things and the Internet of Services. Since all the above nine pillars of the fourth industrial revolution can roughly be conceived to be embedded already in Rifkin's concept of the Third Industrial Revolution (though with different emphases), we will use the latter phrasing here.

1.4 On Transformation and Futures Thinking

Achieving sustainability requires foresight and active collaboration between different stakeholders of the society. The course on Continuous Transformation at Aalto University focused on the mechanisms of social change and suggestions for sustainable ways of living based on different futures scenarios.

Futures studies is about change. Change is continuous. As time passes, something is always being changed in society at large, as well as in nature, technology, politics and daily lives of individuals. Change is a natural part of development and progress – as the motto of this report by the pre-Socratic Greek philosopher Heraclitus reminds us "*Panta rhei*" i.e. "everything is flowing". Heraclitus draws our attention to ever-present change in the universe. His phrase indicates that "No man ever steps in the same river twice". This also means that all the information, knowledge, experience and learning we accumulate *per se* has an impact on the way we see the world, society and ourselves in it.

In futures studies much emphasis is focused on anticipating, identifying and analyzing change – this is based on the process of horizon scanning. The future itself is about change – not only continuous change but also very much interconnected change between various sectors and actors in society. Futures studies use the mode of systems thinking. Accordingly, transformation implies paying attention to social change as change of the entire system – not just some of its sectors. Transformation and especially transformation of society is an apt topic for futures studies. When studying transformation, all key characteristics of futures thinking and futures studies approach can and should be harnessed into use (see Table 1 below). These characteristics can also be used as criteria for futures studies: Are the characteristics involved – and to what extent – in carrying out a specific futures study?

Futures thinking is a generic approach, needed for futures studies applications. Futures thinking can be developed systematically, and be refined to a skill called "futures literacy" (Miller 2007). By futures literacy Miller (ibid.) refers especially to futures storytelling i.e. to the "capacity to think about the potential of the present to give rise to the future by developing and interpreting stories about possible, probable and desirable futures". While the concept of literacy refers to the general skill of reading text, the concept of futures literacy means the special capacity to anticipate futures by "reading" the futures or signs of futures developments. Futures thinking combined with futures literacy will

lead to futures learning – mindset and process where systematic futures thinking is applied by using futures studies methods for acquiring foresight knowledge and for preparing for futures. The concept of ubiquitous learning comprises futures learning (Heinonen & Ruotsalainen 2014). The broader concept of future consciousness as launched by Lombardo (2008) can be interpreted to cover both futures thinking and futures literacy, as well as be a goal of futures learning.

Table 1. Main characteristics of futures thinking applied in futures studies (see also Heinonen 2015b).

	CHARACTERISTIC	EXAMPLE OF APPLICATION
1	Long timeframe	E.g. Years 2050–2100 (>30 yrs).
2	Multidisciplinarity and multisectorality (breaking boundaries between different fields of study, industries, and actors)	Future of gene manipulation addressed by experts of medicine, law, philosophy, genetics, nanotechnology synthetic biology etc.
3	Complexity, systems thinking, and holistic thinking – focus on connections between different fields and spheres	E.g. 15 Global Challenges Framework by the Millennium Project (Glenn & Florescu 2015), and World Scenarios by the Club of Rome/Limits to Growth thinking (e.g. Meadows 2012; Randers 2012).
4	Participatory approaches (inclusive interaction)	Multi-stakeholder participation e.g. through Futures Cliniques or other futures workshops (Heinonen & Ruotsalainen 2013b)
5	Identifying emerging issues, discontinuities, disruptions, tipping points & anticipating surprises (contrafactuality: impossibilities, what ifs?)	Horizon scanning with strong peripheral vision (Day & Schoemaker 2006) and will to survive, be competitive and even antifragile (Taleb 2013).
6	Critical thinking (constant questioning & rethinking)	Deconstruction, analysis, and conceptualisation of assumptions (Inayatullah 2015). Reframing (Miller 2007)
7	Value rationality	Normative: what values, whose values? Transparent goals. (Bell 1997; Malaska 2010)
8	Taking radical, unorthodox, unconventional and outliers' views seriously (out-of-the-box)	Mindful of Dator's 2nd Law: "Any useful idea about the future should appear to be ridiculous" (Dator 1998)
9	Proactivity and action	Affecting and creating the future through policies and implementation. Need for policy relevance (OECD).
10	Alternativity; scenario thinking	Three to four different scenarios, futures images, or alternatives (Dator 2012).

On the other hand, the field of futures studies aims at anticipating change but also at having an impact. Consequently, if one recognizes a stream of change that is not a desired development, measures can be proactively taken to impede such unpreferred change. This is of equal importance to taking steps to promote preferred futures images and scenarios.

What is transformation then? The term "transformation" has a special meaning in genetics referring to the genetic alteration of a cell.[6] In general language use, transformation means comprehensive and groundbreaking change as a process from one state of things into a changed situation or paradigm. According to Merriam-Webster dictionary "transformation" means a **complete or major change** in someone's or something's appearance, form, etc. Some further definitions of transformation are given as the following:

- An act, process, or instance of transforming or being transformed.
- The operation of changing (as by rotation or mapping) one configuration or expression into another in accordance with a mathematical rule; especially a change of variables or coordinates in which a function of new variables or coordinates is substituted for each original variable or coordinate.

Transformation consists of two root words from Latin (trans + forma). "Forma" means "form" and "trans" means "direction over to something", i.e. here **move to another form.** Society can thus be characterized as manifesting itself in transformation – in a complete or major change process into another state. Transformation can be used as an abstract expression or as a concrete one. For example, buildings can be depicted as having underwent various transformations over the years. Synonyms for "transformation" are such expressions as "changeover, metamorphosis, transfiguration, conversion". Related terms for "transformation" include "shift, transition; adjustment, alteration, modification; reconstruction, reconversion, redo, redoing, refashioning, reformation, remaking, remodeling, revamping, revision, reworking, variation; deformation, disfigurement, distortion, mutation, transmutation; displacement, replacement, substitution, supplantation".

Interlinked and long-term processes and dynamics over decades and centuries have shaped our current global system (Buzan and Lawson 2015) in which we live our lives. Transformation – whether it is of whole society or of some parts of it – may take place as a result of how drivers of change have played out and to what degree the change has been governed, managed, or accelerated towards certain directions and outcomes. Achieving transformations for sustainability should actively recognize the necessary changes for power relations such as vested interests, political conflict, and people's cognitive maps (e.g. Olsson et al. 2004).

It is noteworthy that the existing need for transformation may highly vary according to the ends and intentions of different decision-makers and stakeholders. Jointly recognized, pressing societal challenges and threats may accentuate the need for change and even transformation. In particular,

[6] Transformation means genetic alteration of a cell on the basis of the direct uptake and incorporation of exogenous genetic material (exogenous DNA) from its surroundings and integrated through the cell membrane(s). This genetic transformation was first demonstrated in 1928 by British bacteriologist Frederick Griffith.

wild card events may disrupt the current regime and catalyse transformational change by revealing the need for change through devastating consequences. In fact, Walsh et al. (2015, 3) propose that wild card events can be used to better understand infrastructure as a socio-technical system, to envision future sustainable infrastructure, and to assist in co-design adaptation measures with various stakeholders.

Transformation of society and communities covers the whole complex system of PESTEC dimensions (political, economic, social, technological, ecological, cultural/citizen/customer). Major transformation needs may be reflected, not only on political, governance and economic systems and new ways of thinking, but also on concrete technical infrastructure systems. Systems must be transformed to be adaptable to long-term impacts of climate change such as rise of sea level and extreme weather conditions. Transformations are needed because humans are dependent on healthy ecosystems for their well-being. Walsh et al (2015) point out that infrastructure plays a major role on greenhouse gas mitigation targets. The energy and transportation sectors are currently heavily carbon intensive. New technologies and infrastructure configurations could drastically contribute to mitigation efforts. Moreover, the provision of infrastructure can also induce changes in demographics and behavior in support of emission reductions.

What is most needed, however, is a societal transformation penetrating the human mind—from short-term thinking to long-term thinking, from narrow outlook to broad comprehensive, holistic view and systems thinking. According to Garry Jacobs (2015) transition to a new paradigm requires adoption of different way of thinking – different from the present "blind alley" – that is human-centered, value-based, inclusive and synthetic. On the other hand, we also need a transformation from anthropocentric way of thinking to comprehensive biophilic thinking where humans are part not only of society but of the whole biosphere. According to Likhotal (2015, 43) we are facing a radically new reality, both individually and collectively. He sees change no longer as mere theory, nor just an option, but a reality, a "*condition sine qua non*" of our survival.

Hall sees cities as humankind's greatest invention – they are the ultimate hubs for civilization (1998). Transformation towards biophilic society requires paradigm shift not only through science and technology, energy transition (Brown 2015), and politics, but more importantly in our values and ways of thinking. The whole culture of what it means to be human and civil should change into a sustainable relationship between humans, technology and nature. The history of ideas shows us in an interesting way how our relation to technology and nature has changed during centuries (Heinonen 2000). This relationship should now be subjected to serious re-thinking. In order to survive on a limited planet earth, the human species cannot grow limitlessly – the learning process will be about re-inventing ourselves to co-exist with nature.

2. THE STRUCTURE AND STEPS IN THE FUTURES CLINIQUE

The Futures Clinique conducted for the Aalto University course "Continuous Transformation" was tailor-made to fit the needs of the course and the time allocated to it.[7] The Futures Clinique started as a joint session before the groups began their work. Professor Sirkka Heinonen from Finland Futures Research Centre gave a presentation about futures methodology in the first lecture session. The following week, in the second lecture session, she presented the Neo-Carbon Energy project and gave instructions for group tasks. The students were then shown Futures Window, a slide show of photos set to music depicting weak signals provocative of possible futures (Heinonen & Hiltunen 2012), as food for imagining possible neo-carbon futures.

The students split into four groups, each group free to choose 1) a Neo-Carbon Energy scenario out of the set of four transformative scenarios, 2) a topic of interest to them, possibly linking to their other study assignments, and 3) a geographical context. In addition to these three group-chosen variables, all groups were given the time horizon of 2050 and a goal of 100% Renewable Energy system.

The groups engaged in three exercises in the following sequence 1) Futures Wheel, 2) Futures Table (PESTEC – Political, Economic, Social, Technological, Environmental, Cultural), and 3) Black Swans (unexpected high impact future events) with the negative and positive influences it would have on their scenario.[8]

Two groups chose to work on the Neo-Carbon scenario called "New Consciousness". The other two groups worked as follows: one on Value-Driven Techemoths and one on Green DIY Engineers. The group topics were decided after shared discussion to be the following:

- GROUP 1: **Sustainable Built Environment in a local community** + Renewable Energy + **Green DIY Engineers scenario** in **rural/suburban Finland** 2050
- GROUP 2: **Living 2050** + Renewable Energy + **New Consciousness scenario** in **Finland**
- GROUP 3: **Work 2050** + Renewable Energy + **Value-Driven Techemoths scenario** in the **United States**
- GROUP 4: **Farming 2050** + Renewable Energy + **New Consciousness scenario** in **Finland**

[7] One of the modifications was that there were no specific moderators for the group, but they were self-organised, while Sirkka Heinonen moderated all the groups by circulating in them. This was possible owing to the not-too-high number of groups and group members.

[8] On methods see MP Futures Research Methodology V 3.0 (Glenn & Gordon 2009). For Futures Wheel see Glenn 2009 in Glenn & Gordon 2009; for weak signals, Hiltunen 2010; and for Black Swans, Taleb 2007 and Heinonen 2013c.

After working on the Futures Wheel, the group selected one idea or a cluster of ideas to be explored further in the Futures Table. The idea or cluster could be reformulated to be the topic for the table. After the Futures Table session, the group was asked to envision some sudden unexpected events – Black Swans – and pick one for anticipating its positive and negative impacts on their scenario (pros and cons). The artefacts produced from each group's collaboration are reviewed in the next section, according to the steps in the Futures Clinique process: Futures Wheel, Futures Table (PESTEC), and Black Swans.[9]

Figure 2. Students working together in four groups.

[9] The reviews of the results from group work according to the Clinique steps are followed by some back office comments and observations from the Neo-Carbon Energy research group: Nicolas Balcom Raleigh, Sirkka Heinonen, Joni Karjalainen, Juho Ruotsalainen and Marjukka Parkkinen.

2.1 GROUP 1: Sustainable Built Environment in a Local Community 2050 in GREEN DIY ENGINEERS Scenario in Rural/Suburban Finland

This chapter presents the results of Group 1 on Green DIY Engineers scenario. First, the Futures Wheel is presented, followed by the Futures Table and the Black Swans and their implications. At the end of the chapter comments and observations are posed.

Futures Wheel

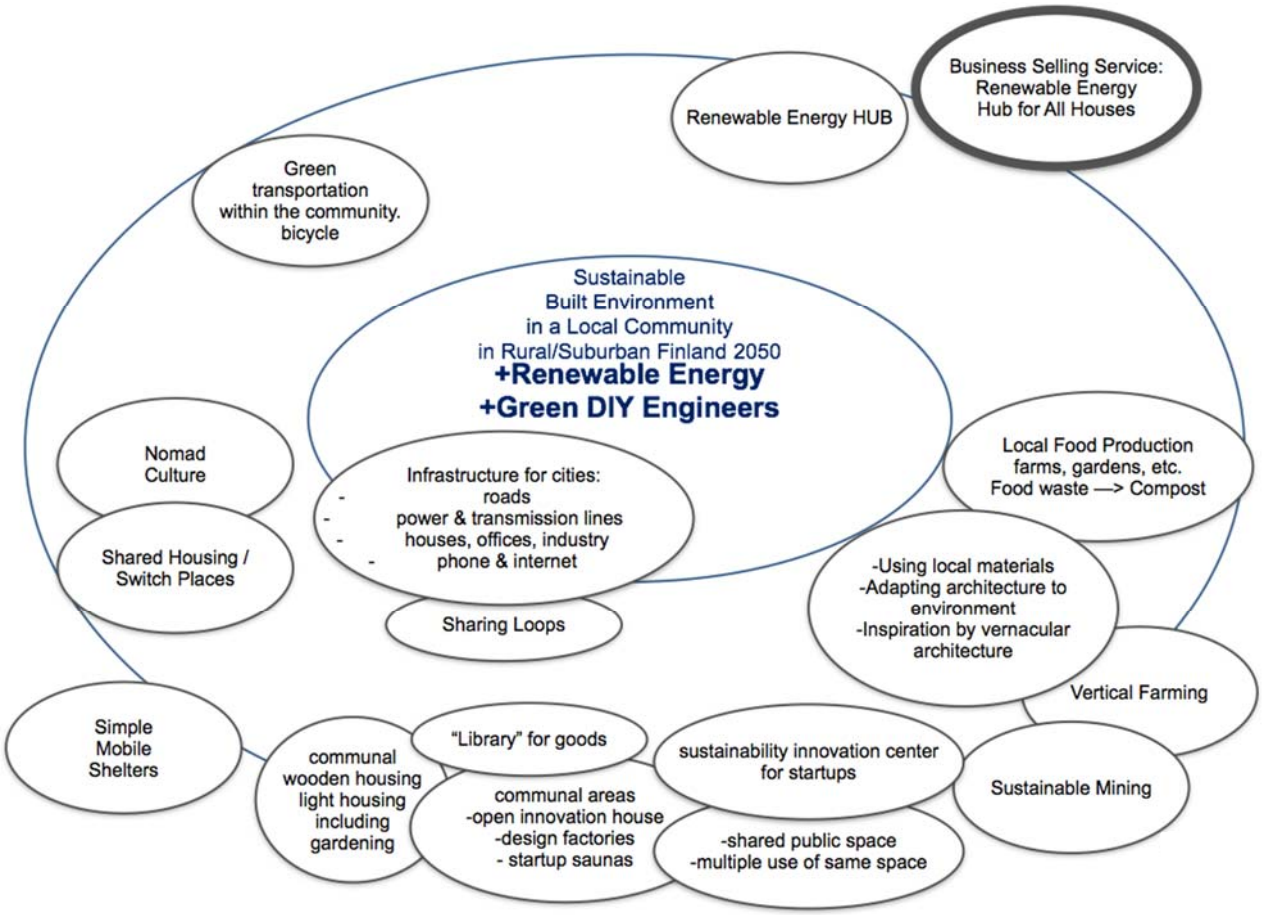

Figure 3. Digital representation of the Futures Wheel produced by Group 1.

Group 1 worked on the topic of the "sustainable built environment in a local community in rural/suburban Finland 2050" in the Neo Carbon Green DIY Engineers scenario. Inside the first circle of their futures wheel they placed "Infrastructure" including roads, power and transmission lines, houses, offices, industry, phone and Internet. Building on the idea of transportation, they placed green transportation with an emphasis on bicycles inside the second circle of the futures wheel.

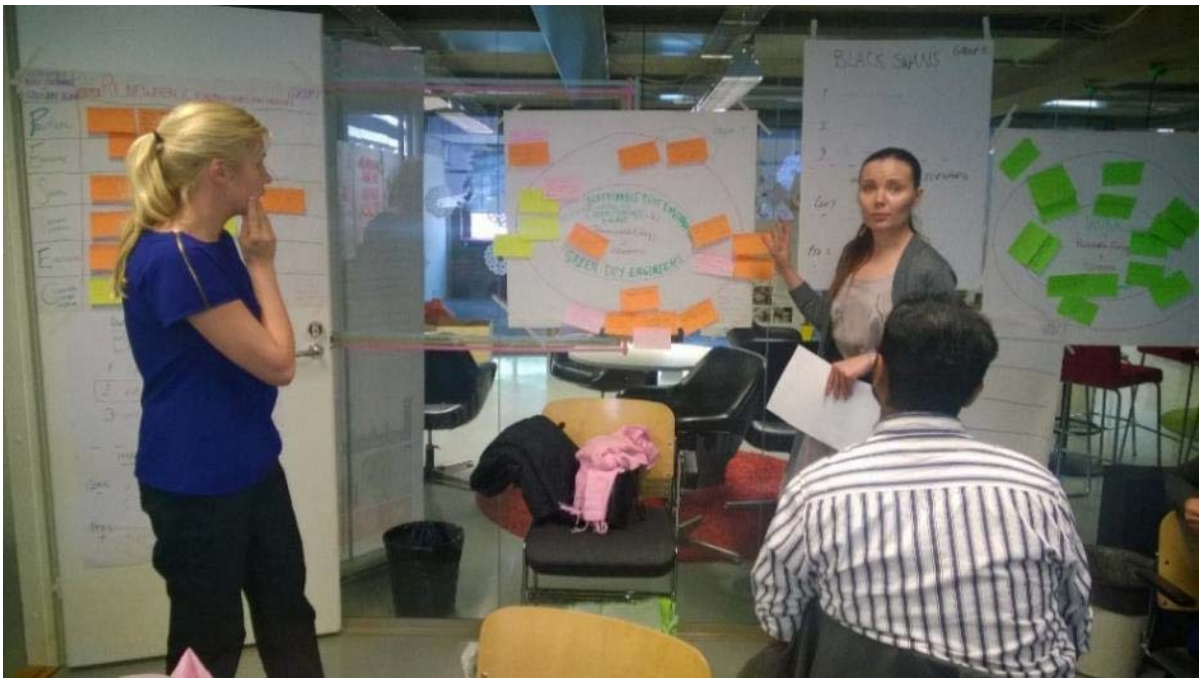

Figure 4. Group 1 presenting their work to the other groups.

Also inside the second circle, they included "nomad culture" and "shared housing and switching places" which, taken together, suggests people are highly mobile and less anchored to a specific home in this future. The group suggests simple mobile shelters would be sold as a product or service to support nomadic living.

The group introduces the term "sharing loops" on their futures wheel, relating to several of their ideas. These include a library for goods where you could check out tools or other resources you may need; communal areas for innovation, startups and design thinking; sustainability innovation centre for startups, communal light wooden housing including shared gardening areas, and shared multi-use spaces.

Materials receive attention inside the second ring. In this future, using local materials will be emphasized and adapting architecture to the environment will be important. The architecture will be inspired by "vernacular architecture," a term which encompasses a broad range of definitions but generally means "structures made by empirical builders without the intervention of professional architects.[10]" Continuing the thought about materials, the group suggests there will be sustainable mining in this future. This idea could be interpreted to mean that mining practices will adhere to stricter environmental standards and be less prone to pollution as they are today, or that people will mine old electronics for rare materials.

[10] Gabriel Arboleda (2006). What is Vernacular Architecture?. Accessed 14 December 2015 in http://www.vernaculararchitecture.com

The group gives food attention as well. Local food production will happen in the community's small farms and gardens. All food waste will be used as compost. There will be vertical farming. Picking up the renewable energy theme, the group indicates this community will have a "renewable energy hub" to power all houses. They selected this idea as the starting point for their Futures Table.

Futures Table (PESTEC)

Table 2. Group 1 Futures Table "Renewable Energy Hubs for Houses".

Sustainable Built Environment in Rural and Suburban Areas in Finland + Green DIY Engineering 2050	**Renewable Energy Hubs for Houses** NeoCarbon Aalto 22.5.2015 Group 1		
Political	Renewable energy can be sold back to the grid	Higher taxes for non-renewable energy sources or fossil fuels	Government subsidies to fund renewable energy hubs
Economic	Low Prices / Fixed Costs	Businesses provide renewable energy technologies: Solar panels, wind power…	One wind mill / 10 houses. Community owns it.
Social	Not In My Backyard NIMBY (Windmill away from community)	Stronger community spirit	Change of mindset in energy use
Technological	Solar roofs / solar walls	Improvement of the battery technology	New solutions for wind mills so that birds won't die
Environmental	No fossil fuels, all renewable	Possible Challenges: Windpower might disturb birds / other animals	No worsening impact to greenhouse effect
Customer Culture Citizen	Communities own energy sources themselves	"Green Cities"	

Group 1 named their futures table **Renewable Energy Hubs for Houses**, keeping the idea the same as it was first presented in their Futures Wheel. They generated three items per row for PESTE and two items for C. Focusing on the items they found most interesting, government subsidies will fund the renewable energy hubs (Political) while businesses provide renewable energy technologies such as the solar panels, wind turbines, etc. (Economic). People will have a change of mindset regarding energy use possibly taking the form of strong commitment to renewable energy and greater attention to conserving energy (Social). Improvements in battery technology will be a key driver to the viability of energy hubs as a means to address intermittency issues (Technological). Taken all together, these renewable energy hubs make it possible for everyone to switch from fossil fuels to renewables and

produce no worsening impact to greenhouse effect (Environmental). People will insist upon living in "green cities" (Customer-Culture-Citizen).

Black Swans and Their Implications

The group identified three Black Swans and selected "No proper technology available" as the one with the greatest impact on their scenario. They listed negative impacts of this Black Swan as "We don't know" and "The hub is not possible". For positive impacts, they listed "Not known". Without the tech we'll need to produce and widely distribute viable renewable energy hubs at reasonable prices, the future image created by Group 1 cannot happen.

The group chose an important Black Swan for any renewable energy future in 2050. Technology often takes many decades before it becomes commonly used. The priorities we make today for technology development can have dramatic impact on the viability of renewable energy in the future.

Table 3. Black Swans and their implications as generated and identified in Group 1.

Black Swans
Item selected by group in bold. 1. Unpredictable effect of climate change **2. No proper technology available** 3. Some specific source/particle needed unavailable **Impacts on our Scenario** Cons 1. We don't know 2. The hub is not possible to be developed Pros 1. Not known

Comments and Observations

Focusing on community-level energy production is an excellent anchor point for exploring this possible future. It is both easy to comprehend and complex enough to provoke questions. Limited scale pilots for these types of projects have been tried in some communities. For example, a community invested in solar panels for the rooftop of their local ice cream parlour in St. Paul, Minnesota, U.S.[11]

[11] In 2005, Izzy's Ice Cream succeeded in installing community-funded solar power. Retrieved 29.7.2015. http://izzysicecream.com/2005/11/23/solar/

while a larger scale instance can be found in the energy self-sufficient village of Feldheim, Germany.[12] Conflict and dynamics are important to describe in scenarios. The group included (but did not circle) "Not in My Backyard" in their PESTEC table. This concept is a fruitful starting point for investigating dynamics in the Green DIY Engineers scenario as well as the other three Neo Carbon scenarios. It is very realistic to imagine communities having concern about where their renewable energy hub is placed depending on what technology the hub requires. Is it loud? Is it ugly? Does it have any risk for explosion? These are significant questions that point to the need for attention to health and aesthetics in designing these hubs.

The group also hints at another dynamic between government subsidies for energy hubs and businesses providing the technology used to build those hubs. It may be worthwhile to research historical cases of government subsidies intended to spur growth of specific industries and electrical infrastructure in order to use these cases as analogies. What are pitfalls of such programs? What works? What systemic feedback loops can either advance the objective of a renewable energy hub for every community or work against it?

Moreover, the group placed emphasis on the importance of a mindset change. Imagine living in a world where you know your energy is always clean and then visiting another country where it is still quite dirty. If you have pride in your renewable energy lifestyle, you may feel wrong to suddenly rely on a system that is still coal-fired. An analogy could be found in people who have composting at work or school, but not at home – it feels wrong not to compost after it has become habit. Mindset change will be an essential feature of all of the Neo-Carbon scenarios, but would play a particular role if the Energy Hubs are limited to powering houses in rural/suburban Finland.

The ideas of "library for goods" from the futures wheel, and "green cities" from the PESTEC were pragmatically enticing. Both can be realized both now and in any future, they are not tied to the scenario. It would be interesting to vision in more detail what is meant by a "green city" and how existing cities can transform into green cities. Emphasising local food this group reminds us how dependent systems large cities are. Green cities could thrive with a much higher degree of regional self-reliance than today's conventional cities (Girardet 2015). In addition, the idea in the futures wheel of a "sustainability innovation centre for Startups" is thought provoking. This group might continue thinking how their diverse ideas should be integrated into the different levels of planning processes of the built environment. With regard to the Futures Table, a further brainstorming might be interesting to have: If communities own their energy sources, what does it mean?

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[12] 100% Renewable Community, Go 100% Renewable Energy
http://www.go100percent.org/cms/index.php?id=70&tx_ttnews[tt_news]=129

2.2 GROUP 2: Living 2050 in NEW CONSCIOUSNESS Scenario in Finland

This chapter presents the work by Group 2 on New Consciousness scenario. It starts with Futures Wheel and the Futures Table, followed by the Black Swans and their implications. At the end of the chapter comments and observations are posed.

Futures Wheel

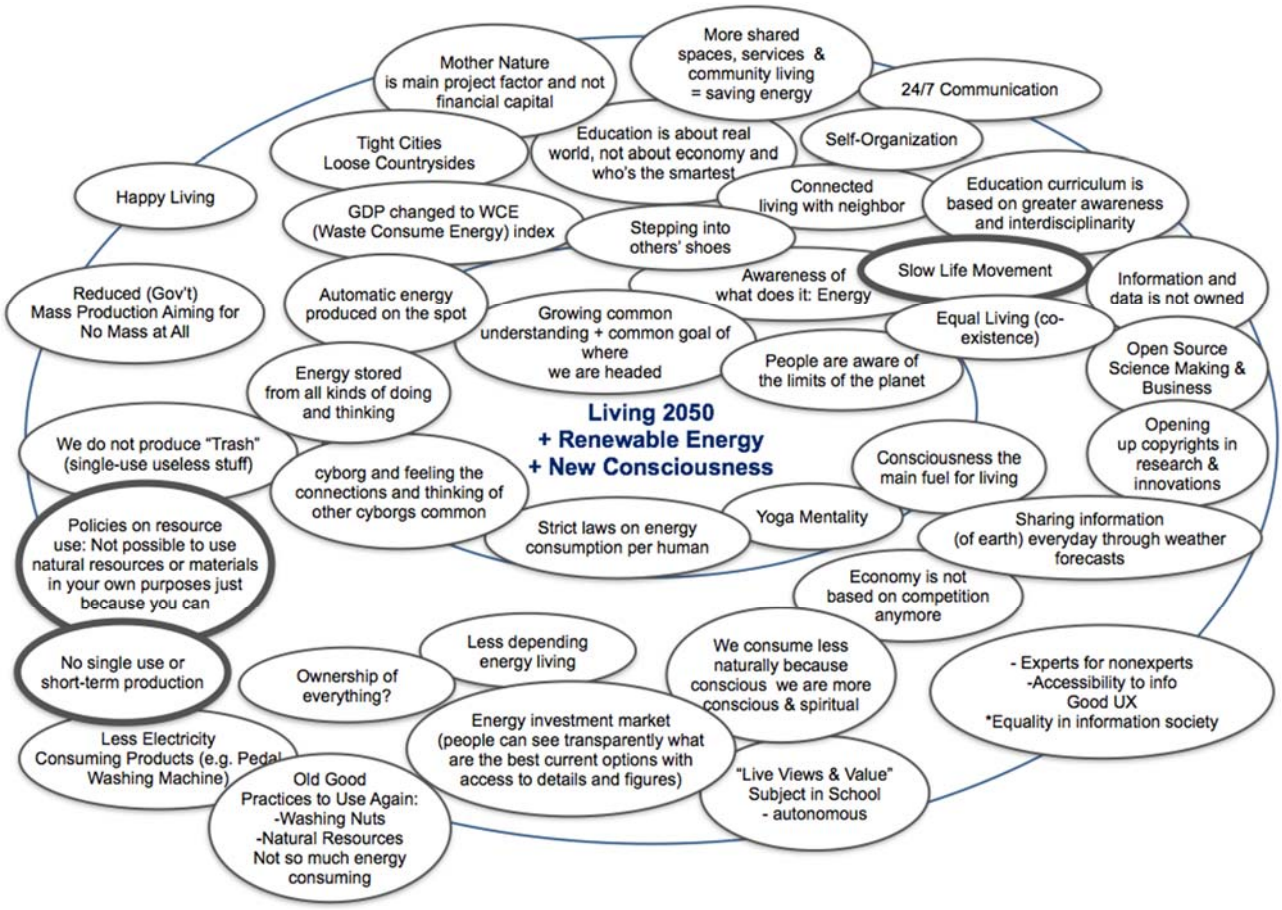

Figure 5. Digital representation of the Futures Wheel produced by Group 2.

Figure 6. Group 2 presented Living in New Consciousness scenario.

Group 2 was the most productive of the four groups in terms of the quantity of ideas generated on their Futures Wheel. Because there were so many ideas on the sheet, it was somewhat difficult to determine what was inside or outside which circles. Effort has been made to approximate these relationships as best as possible. Starting inside the first circle, people in this future have a growing common understanding and common goal of where we are headed and a general awareness of the limits of the planet. They also have an awareness of energy – what it does and where it is generated. Energy is generated and stored from all sorts of movements and activities – even thinking generates useable energy. Automatic energy is produced on the spot. This awareness is enforced as well through strict laws on energy consumption per individual. Consciousness is the main fuel for living and people strive to be present in the moment or have a "yoga mentality." People are cyborgs and feeling connection to other cyborgs and their thinking is common.

Many ideas centre on empathy.[13] "Stepping into the shoes of others" is common and people feel a heightened connection with their neighbours. Communication is happening 24/7. People's awareness of the limitations of the planet is helped by frequent news about the planet during weather forecasts. Empathy and communication drive a capacity for self-organization at all levels of society. This self-organization drives an increase in shared spaces and services and community living, which in turn saves energy. It is a future of happy living – even though there are tight cities and loose countryside.

People are less dependent on energy, partly because people consume less because they are more conscious and spiritual. An energy investment market makes it more transparent for people to see details and figures about their energy options. Energy consumers can tell immediately how their buy-

[13] This reminds us of Rifkin's (2009) ideas of *homo emphaticus* and visioning of emerging emphatic civilization. Rifkin invites everyone to rethink the established belief that humans are by nature aggressive, materialistic, utilitarian and self-interested. Instead, he claims us human beings as a fundamentally emphatic species which may prove critical for our survival. The Age of Reasoning is being eclipsed by the Age of Empathy. According to Rifkin (2009, 3) the most important question concerning the future is: "Can we reach global empathy in time to avoid the collapse of civilization and save the Earth?"

ing decisions affect the bigger picture. Energy is produced on the spot. The GDP – the international benchmark for national performance – has been changed to WCE (Waste Consumed Energy).

The economy is not based on competition anymore, Mother Nature – or planetary stewardship – is the new main focus instead of financial gain. Structures of ownership have also changed dramatically. The group asks, "Ownership of everything?" One answer could be everyone owns everything together – similar to key ideas of circular economy. Along these lines, ideas from the open source movement radically transform how scientific knowledge and business ideas are distributed. Traditional concepts of Intellectual Property Rights are abandoned in favour of concepts geared toward rapid idea dissemination and adoption. There is "equality in the information society" aided by exceptional user experience (UX) design in ICT systems. Information is accessible and convenient for experts and non-experts alike. Information and data is never owned and Intellectual Property Rights are dismantled to allow innovations to spread more rapidly.

Education systems have also transformed in this system. Supporting the scenario's heightened spirituality, "Live Views and Values" is taught in schools giving students an autonomous sense of being. Curriculum is interdisciplinary and based on greater awareness. Education is about the real world and not about economic achievement or who is the smartest.

Commodities have also transformed in this future. Old practices that do not use so much energy are brought back into practice, the group gives the example of laundry nuts – nuts which have traditionally been used as an expectorant in Nepal and India.[14] New products powered by people instead of electricity (e.g. pedal powered washing machine) are popularly available. Mass production has been reduced via government policies aiming for no mass production at all. Single-use objects are forbidden. Resource use policies restrict when natural resources can be used and for what purposes – single actors can no longer abuse a natural resource just because they can. Products with intentionally short-term life cycles, such as many consumer electronic devices, are no longer manufactured or sold. This less materialistic aspect combines with the new consciousness to connect the whole scenario to the slow life movement, an emerging collection of trends aimed to address the feeling of "time poverty."[15]

Group 2 selected their ideas of policies restricting resource use, no single use or short-term production, and slow life movement as their starting point for Futures Table.

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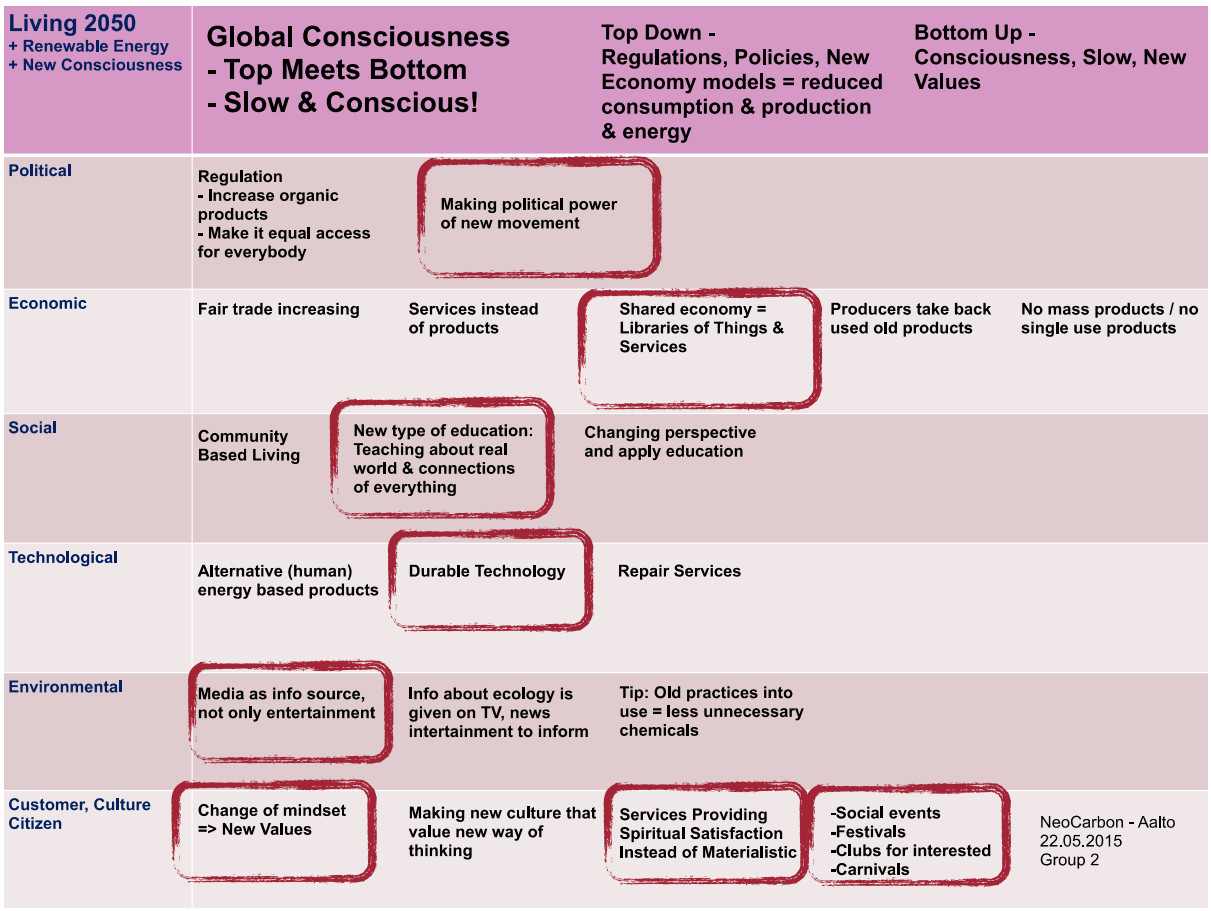
[14] "Soap Nuts for Natural Laundry Care" http://wellnessmama.com/7553/soap-nuts-laundry-care/

[15] See the Slow Movement website for details. http://www.slowmovement.com/; see also Heinonen, Halonen & Daldoss, Lorenzo (2006); Heinonen 2013b.

Futures Table (PESTEC)

Table 4. Group 2 Futures Table "Global Consciousness: Top Meets Bottom, Slow and Conscious!"



Group 2 named their Futures Table "Global Consciousness: Top Meets Bottom, Slow and Conscious!" In addition, they annotated the table header with definitions about what they meant by "Top Down" and "Bottom Up". Top down regulations, policies, new economic models lead to reduced consumption and production. Bubbling up from the bottom, people will expand their consciousness, promote slow living, and support new values. Top meets bottom to set the stage for slow and conscious living. New values are consolidated into a radical change of the mindset, creating a culture of new thinking.

Reviewing the items Group 2 selected as most interesting on their Futures Table, living in 2050 is shaped by a new movement making political power and using its political power to make top-down changes (Political). A sharing economy will take hold and include features like Libraries of Things where instead of buying new goods for limited-time needs, people will borrow them (Economic).[16]

[16] An example of a Library of Things is Sacramento Public Library's initiative. Milne, Steve. "Library of Things Launches on Saturday." Capital Public Radio. Retrieved 5.6.2015. http://www.capradio.org/articles/2015/03/12/library-of-things-launches-on-saturday. Helsinki City Library has also an array of things such as sports equipment and music devices to borrow as their services. You can

Education will happen in new ways with an emphasis on teaching about the real world and the interconnectedness among all things (Social). Technology will be built to last. When a device breaks, it is repaired instead of being replaced (Technology). After a tiring trend of click-bait (e.g. "You won't believe what this person ate for dinner") passing for news in the mid-'10s, media in all of its forms returns to its role of serving as a reliable information source about the environment and the planet (Environmental). An overall change of mindset among the population has led to new values, an abundance of services to provide spiritual and immaterial satisfaction, and social events, festivals, clubs, and carnivals that bring communities together and promote cultural development (Customer, Culture, Citizen).

Black Swans and Their Implications

Group 2 generated three Black Swans and selected "**an airplane crash or terrorist attack kills five world leaders of G8**" for further consideration. The negative implications of such an event for their scenario are that the world becomes much stricter about public security and a political power game accelerates into chaos. The positive implications are that the loss of these leaders could open up an opportunity for a new political arrangement and that the process (presumably for ecological destruction, climate change, and neoliberal capitalist growth) slows down. In essence, Group 2 identifies the idea that if key world leaders were to face such an unfortunate demise, the response would either be a doubling down to support the current world order or a new opportunity for their scenario to take shape.

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digitise your LPs and cassettes, or borrow a sewing machine or a piece of art. These kind of innovative new services are available to library users in Finland. Originally built to educate citizens, libraries now act as multimedia-equipped public living rooms. They even organise outdoor activities outside their premises. http://finland.fi/Public/default.aspx?contentid=254931&nodeid=41800&culture=en-US

Table 5. Black Swans and their implications as generated and identified in Group 2.

Black Swans
Item selected by Group 2 in bold. 1. Earthquake / Huge / Everest Area **2. Airplane Crash or Terrorist Attack killing 5 World Leaders of G8** 3. Worldwide pandemia of unknown or no-cure disease (e.g. Ebola) **Impacts on our Scenario** <u>Cons</u> - Become strict about public security - Political power game accelerates into chaos <u>Pros</u> - New political arrangement / new opportunity - The process slows down

Comments and Observations

Group 2 had a productive conversation covering a wide range of topics, which has led to a robust description of living in 2050 as part of the New Consciousness scenario. Several of the items on the group's future wheel are supported by weak and strong signals in the present, lending them more credibility (evidence-base foresight). Looking at the themes on Group 2's futures wheel – education, energy, information, food, consciousness, cyborgisation, etc. – could serve as a way to identify drivers for further investigation.

From the futures wheel the ideas of economy without competition and cyborgs enabling shared consciousness really merit closer attention and ponderings. The end point of "mobile technology" is technology embedded in the body, i.e. a "real" cyborg. "Energy stored from all kinds of doing and thinking" is also a bold statement towards holistic approach. Energy seems to have become a highly personal matter. It would also be interesting to learn more from the group what is the WCE, Waste Consume Energy Index, and its potential influence.

From the PESTEC table the idea of "spiritual services" seemed particularly interesting. The idea of "New kinds of education" based on values also digs deeper into the foundations for transformational change: What kinds of changes in education & educational structures would the group envision/implement in practice in this world of new consciousness?

2.3 GROUP 3: Work 2050 in VALUE-DRIVEN TECHEMOTHS Scenario in USA

The work of Group 3 on Value-Driven Techemoths scenario is presented in this chapter. The Futures Wheel, the Futures Table and the Black Swans alongside with their implications are presented. The chapter ends with comments and observations on the group's work.

Futures Wheel

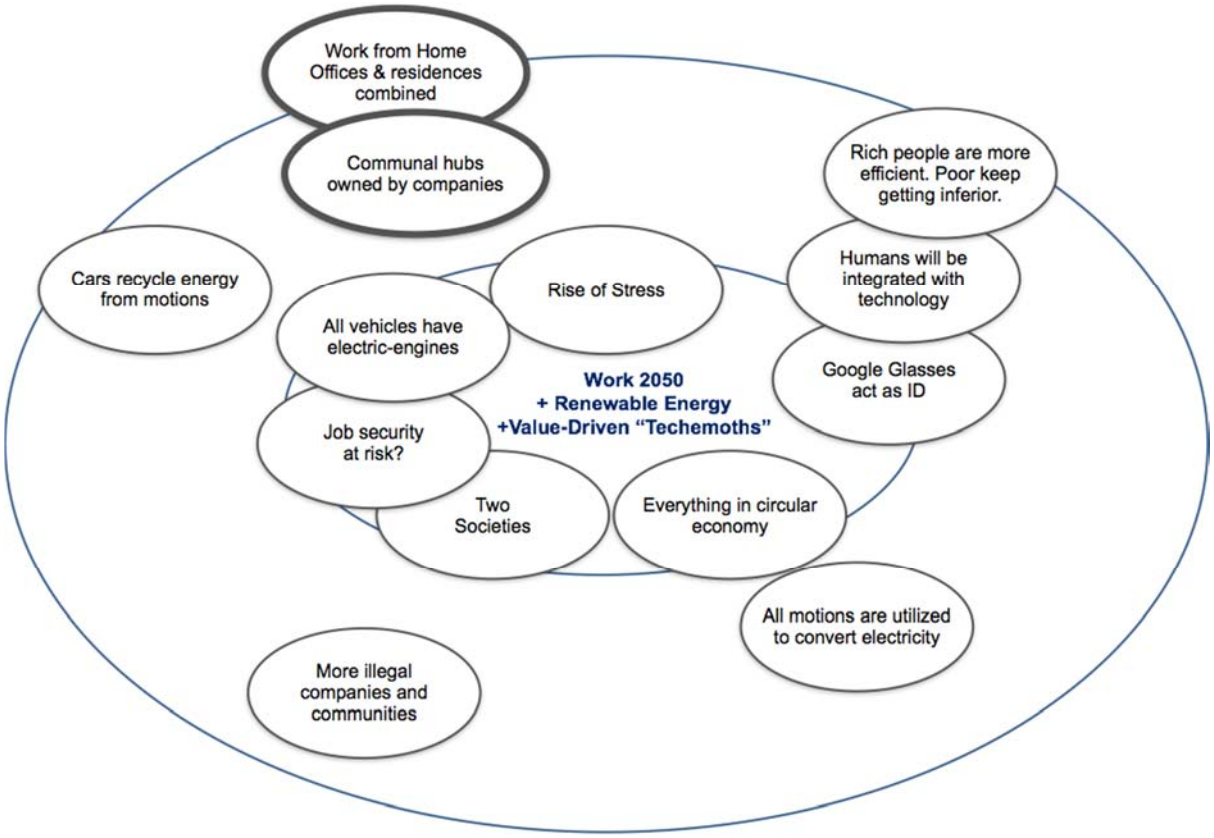

Figure 7. Digital representation of the Futures Wheel produced by Group 3.

Group 3 chose to focus on Work in the United States and the Neo-Carbon Value-Driven Techemoths scenario. Within the first circle of their Futures Wheel, they placed technologically themed ideas "everything in a circular economy," "Google Glass as an ID," and "all vehicles have electric engines;" as well as quality of life and social themes "rise of stress," "two societies," and "job security at risk."

Figure 8. Group 3 presenting the results of their topic of Work 2050 in Value-Driven Techemoths Scenario.

Stemming from Google Glass as ID, they expanded into the second circle with "humans will be integrated with technology." Combining humans integrated with technology with the group's "two societies" idea leads to "rich people are more efficient while poor people getting inferior."

Riffing off of the work-themed items, they imagine there will be "communal hubs owned by companies" where people would go to work together as well as residences designed to double as work places. The electric vehicle idea led the group to think about cars that recycled their energy from motions, and bringing this idea to a more extreme level, they imagined all motions would be utilized in generating electricity.

The group also imagined a source of conflict in this scenario – countering the prevailing force of the 'Techemoth' companies, splinter groups would break off and form their own illegal communities and companies.

Group 3 selected "work from home offices and residences combined" and "communal hubs owned by companies" as the two ideas they would investigate further in their Futures Table.

Futures Table (PESTEC)

Table 6. Group 3 Futures Table "(u.s.) i-topia".

Work 2050 + Value-Driven Techemoths	(u.s.) i-topia				
Political	Independent political system / City-State	Democratic	Corporate Structure Same as Political Structure		Group 3 NeoCarbon Futures Clinique - Aalto 22.5.2015
Economic	Companies are completely public	Company profits used for development of community	Hierarchical income equality		
Social	Communal activities encouraged by company	Out of job, out of hub, out of society	Social benefits given by company		
Technological	Technological identity	Only public transport	Self-efficient in energy	More renewable energy	
Environ-mental	Independent ecosystem	Self-efficient food production	Only organic food		
Customer Culture Citizen	Strong loyalty towards Hub	Carbon footprint account	High duality food in Hub	Nudist colony	Mandatory to have fit bodies

Focusing on the items in the Futures Table selected by the group as most interesting, work in the "Techemoth" scenario in the U.S. looks similar, but perhaps more extreme, to how the U.S. is today. However, in Group 3's imagination, the U.S. political structure would be the same as the structure of its corporations while still being a democracy (Political). Income inequality will be even greater leading to an emphasis on social hierarchy (Economic). If a person finds themselves to be out of work, they are expelled from the "techemoth"-run communal hub and therefore unable to receive any social benefits or enjoy any social status (Social). On the whole all communities are energy self-sufficient thanks to the widely available and dependable renewable energy (Technological). The new structure of society based upon communal hubs leads to independent ecosystems (Environmental). People have strong loyalty to their corporation-run communal hubs (Customer, Culture, Citizen). The group came up with some unique and surprising ideas for the Customer, Culture, Citizen row including individual carbon footprint accounts, hub/corporate mandates to have fit bodies, duality of food quality in the hubs (good food for the wealthy, low-quality food for the poor), and something about a nudist

colony which may mean some hubs have themes, such as being nudist colonies to celebrate all of the mandated fit bodies or, alternatively, some nudist colonies springing up as "illegal communities" outside of the hubs.

Black Swans and Their Implications

Group 3 came up with three possible Black Swans, "Mt. St. Helen Erupts", "Credit Default", and "Zombie Epidemic." They chose **Zombie Epidemic** as the Black Swan to explore further.

The negative implications of a zombie epidemic on their scenario would be contaminated natural resources, unstable society, and loss of knowledge about technology. It is easy to imagine how all three of these implications would play out in this possible future.[17] Contaminated natural resources could drive the hubs to compete with each other for any remaining uncontaminated ones. The epidemic could intersect with the wealth inequality to trigger social unrest.

And nothing destroys minds like zombies – it would be a literal brain drain – leading to a loss of access to technological knowledge (however, by 2050, there may be Artificial Intelligence and other systems in place to keep some key systems in operation even without their human operators).

For positive implications, Group 3 imagines a zombie epidemic would open up an opportunity for the lower classes of the economy to take charge – but only if they can find a way to stay healthy. While losing so much human life would be devastating, the silver lining is that it would control the population explosion which would help humanity in its use of natural resources.

[17] Many science fiction movies have recently demonstrated possible impacts and outcomes of zombie epidemics.

Table 7. Black Swans and their implications as generated and identified in Group 3.

Black Swans
Item selected by group in bold.
1. Mt. St. Helena Erupts
2. Credit Default
3. Zombie Epidemic
Impacts on our Scenario
Cons
Contaminated Natural Resources
Unstable Society
Loss of knowledge of technology
Pros
More opportunities for lower level to take charge (they have to be healthy)
Control Population Explosion

Comments and Observations

The thinking of Group 3 is focused. While there are few ideas on the Futures Wheel, the group did a great job imagining implications of these ideas on their Futures Table and thinking of Black Swans that would have an impact on the future they envisioned.

The idea of Communal Hubs is similar to old system of Chinese "danwei"[18] – gated communities which allocated social benefits and employment to their residents. It is also similar to the common practice of U.S. corporations giving their employees essential benefits like retirement funds, healthcare, and access to education opportunities. Such a system would be an efficient way for "Techemoth" company to distribute its benefits to its consumer-employees. However, like in the "danwei" system, there would likely be inequality in how resources are distributed. The group identified interesting implications of the communal hubs in terms of having tremendous social stakes attached to one's employment as well as possible hub requirements such as "fit bodies" or even tech-

[18] A danwei, or work unit, constituted a form of social organization as urban pattern in Maoist China. The principle of organizing workplace and housing as a spatial unit was adopted. Each citizen was assigned to a unit that would provide for his/her work, together with social and cultural needs. http://transculturalmodernism.org/article/70. The employees inhabited these units as self-sufficient entities, providing facilities including housing, schools, a canteen medical care, etc. Frequently smaller neighboring enterprises shared 'a common set of facilities'." Lue, Junhua, /Rowe, Peter G/ Zhang, Jie (Eds.) (2001). Modern Urban Housing in China. New York: Prestel München New York.

nological integration with your person. Signals of these trends are already emerging.[19] It is important to ask, is this a desirable future?

Among the ideas in the futures wheel, it is a valid point that inequality tends to polarize – the well-off become more efficient, more fit, healthier etc., and vice versa. How might inequality be addressed in the "Techemoth" future? And, will it be less or more prevalent than the inequality that exists today? Inequality as regards integration of humans with advanced technology was described in relation to wealth. How about inequality as related to the level of skills and knowledge as well as knowhow of human/technology interaction?

Circular economy is an interesting concept. The group might continue thinking about the following practical aspects: What obstacles need to be overcome to realize it? What solutions could you envision? The idea of all motions being utilised in generating electricity is ambitious one, while it could be addressed in more detail: in which situations and how for example the infrastructure and its users could absorb and process kinetic energy. Techemoth companies could perhaps harness all their technical structures to benefit from the users' movements. The users could also be invited to extra mobility in order to generate thus more energy. Electric vehicles might become *perpetuum mobile* tools and not only propulse themselves but also feed energy to the existing infrastructure.

In the PESTEC table the idea of "company profits used for development of community" could start a virtuous circle – if companies started to "invest" in communities, results would probably be very interesting! How would these investments be different or similar to the corporate taxes, which exist today? Such investments might feature something very specific according to the company strategy. While regular taxes remain part of the standard public decision-making process, these company-profiled investments and pop-up investments might be more freely concerned with special efforts regarding food, health, childcare, senior care, sports, greenery etc. Perhaps large companies could create the 'ecosystems' the group mentions – and by creating systemic loops for circular economy, their solutions could be multiplied. Techemoths might also be tuned to the idea of "doing well by doing good" and even compete with each other in this respect. Competitiveness would then gain another dimension – that of social competitiveness where economic profitability would combine with social wellbeing.

[19] An example can be found in this *Telegraph* article. Rudgard, Olivia (2015) Why are employers using wearable tech to monitor their workers? *The Telegraph* 1.7.2015 http://www.telegraph.co.uk/news/health/11701767/Why-are-employers-using-wearable-tech-to-monitor-their-workers.html, retrieved 3.7.2015.

2.4 GROUP 4: Farming 2050 + NEW CONSCIOUSNESS Scenario in Finland

Group 4 worked on New Consciousness scenario. Their results are presented in this chapter. The Futures Wheel, the Futures Table and the Black Swans together with their implications are introduces. The chapter is concluded with comments and observations.

Futures Wheel

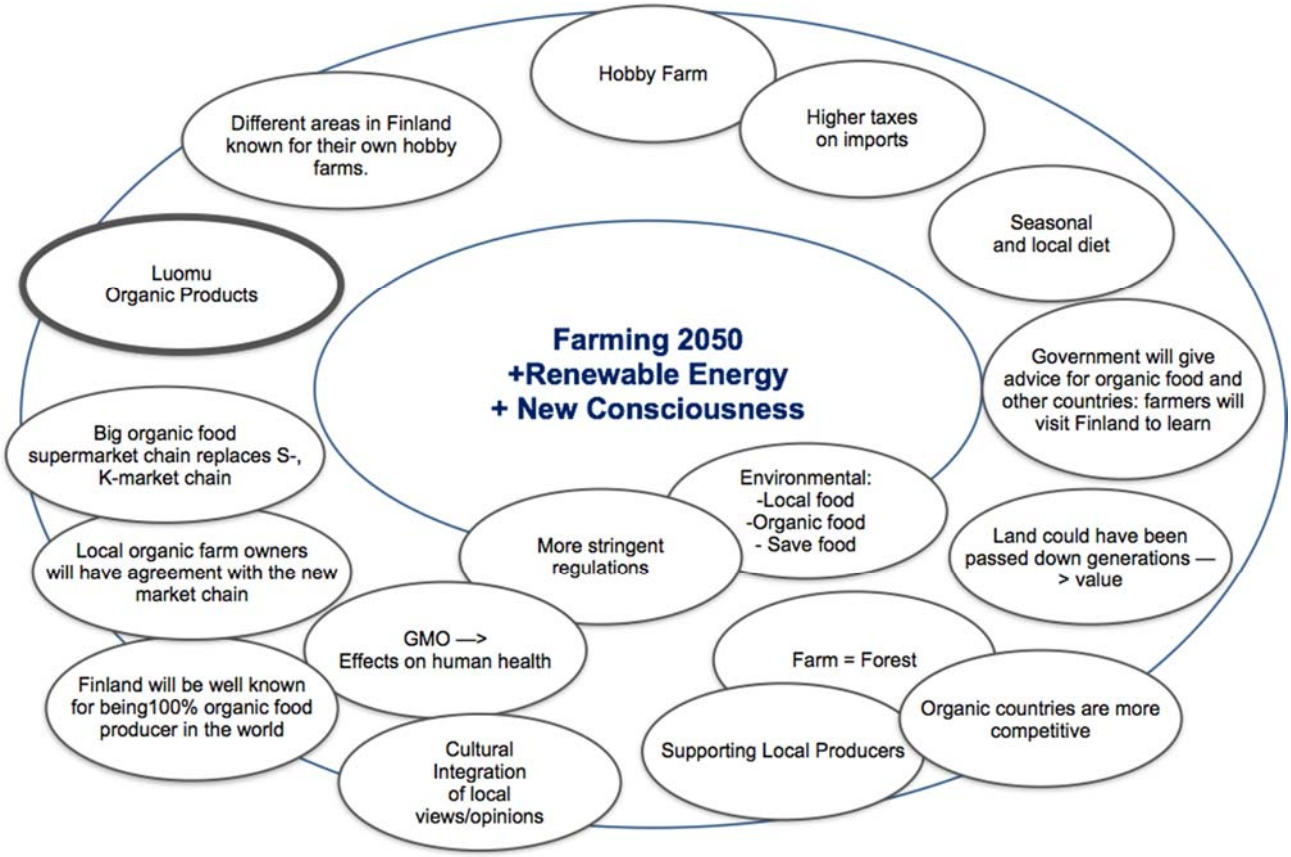

Figure 9. Digital representation of the Futures Wheel produced by Group 4.

This group investigates the topic of Farming in 2050 with a geographical focus of Finland. Their Neo-Carbon scenario is New Consciousness. Near the centre of the wheel, they placed the ideas "More stringent regulations" and "environmental: local food, organic food, save food.[20]" Combining these

[20] The expression "save food" refers to avoiding the loss and waste of food. However, the group also paid attention to "safe food", to the quality of food being high and healthy.

two ideas, we can imagine this future as having regulations that require local and organic food production while placing great emphasis on reducing food waste.

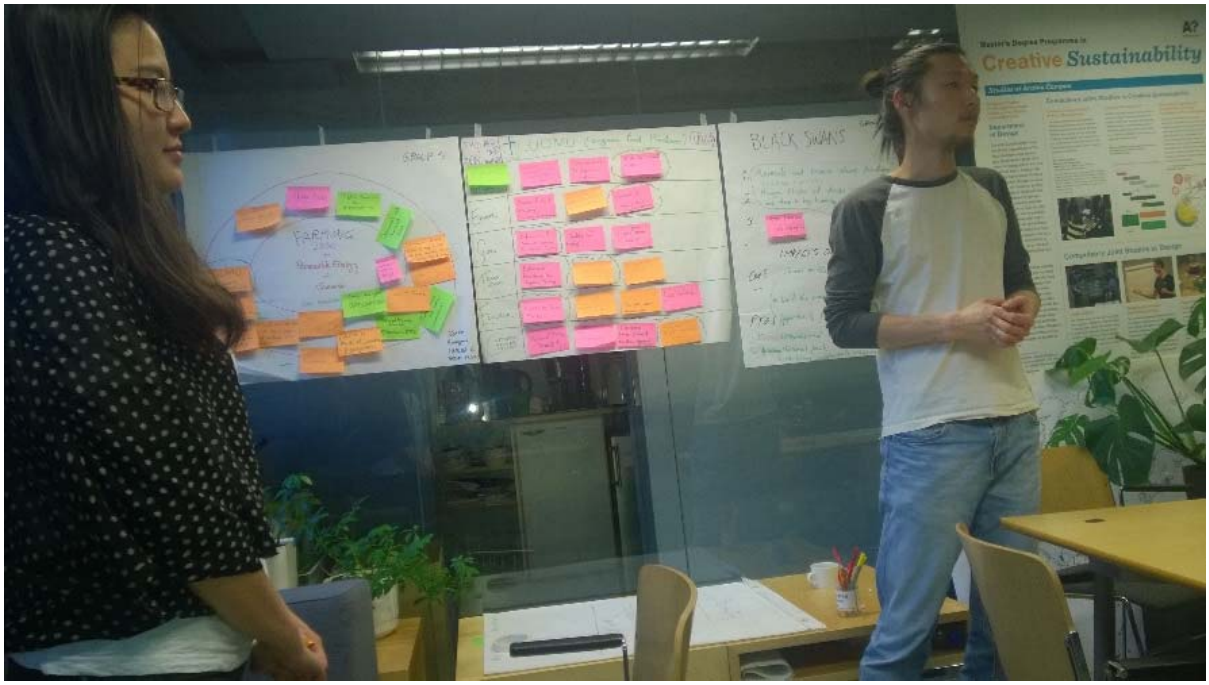

Figure 10. Group 4 presenting Farming 2050 in New Consciousness Scenario.

Moving outward to the 2nd circle from the stringent regulations, the group lists GMOs (Genetically Modified Organisms) having (presumably negative) effects on human health. In their world, GMOs are banned. These stringent food and farming regulations will be shaped by integration of local views and opinions. Also, the country will protect its organic farming by placing high taxes on imported foods.

Finland will be well known worldwide for being a 100% organic food producer – all crops and meats produced here are organic. Organic foods give countries a competitive advantage – the group did not describe how, but it could be by reducing the cost of removing chemicals from water runoff or by reducing cancer rates thereby reducing national healthcare costs. Because of Finland's successes as a 100% organic producer, farmers and government officials from other countries will come to Finland to learn how to make their own food systems organic. Along with this transformation, a big organic food supermarket chain replaces S- and K- grocery chains leading to new and abundant supplier contracts for local organic farmers.

The group envisions land being passed down generation to generation, increasing its value for farming as organic stewardship is maintained. Also, different regions of Finland will be known for their farming specialties, and a back-to-land movement will lead to the popularity of hobby farming. People will eat seasonal and local diets. The group produced the somewhat puzzling idea of "farm = forest". This could mean that many foods – such as berries, edible plants, and mushrooms – are for-

aged even more actively from the forest in this world. Or, more radically, it could mean the end of monoculture farming and the development/reintroduction of growing crops in the woods.[21]

This evokes the idea of expanding the meaning and contents of the concepts of both "farm" and "forest". This kind of questioning the established concepts is very typical in futures studies – looking ahead into the futures where the current concepts have evolved into something else or have gained new elements, characteristics and uses. On the other hand, it may be noted that in Finland we have a long tradition of utilising a variety of products from forest (berries, mushrooms etc). A forest can in this way be considered as a kind of a farm already.[22]

Group 4 selected Luomu Organic Products as their main idea for further exploration in their Futures Table.

[21] See book *Farming the Woods by* Ken Mudge and Steve Gabriel. http://www.chelseagreen.com/permaculture-subject/farming-the-woods

[22] The concept of "farm" can also grow into something else than just a traditional farm in the countryside. Urban farming is a rapidly growing phenomenon where elements of traditional farming are introduced in smaller scale or solution into the urban fabric in cities.

Futures Table (PESTEC)

Table 8. Group 4 Futures Table "Suomen Luomu <Organic Food Products>"

Farming + New Consciousness Finland 2050	Suomen Luomu <Organic Food Products>				Group 4 NeoCarbon Futures Clinique Aalto University
Political	Regulations: Amount produced organically assigned to each region (minimum requirement)	Tax exemption for Organic Products	All the food in Finland is organic!		
Economic	Boost of local economy	Provision of farming of equipment of seeds given at a cheap fixed price to farmers	Competitive. Food products in global market.		
Social	Education & Advice Center for Organic Farming	Healthy Food (Safe)	Farmers + people are more healthy		
Technological	Education Institute for Organic Farming	International collaboration on better efficient solutions	Innovation grants —> students		
Environ-mental	Farm=Forest Rich Soil	No soil loss. Keeping land fertile and no erosion	Less food waste (transportation and storage)	Less CO2	
Cultural	National (Country) Brand	More services for informing people	Citizens have pride for their national products	Finland known for popular organic products —> tourism	

Some ideas from Group 4's future wheel also appear in their PESTEC futures table. Starting from the idea of Suomen Luomu (Organic Food Products), the group imagines all of Finland's political leaders and institutions are in alignment with the vision and reality of "all food in Finland is organic!" In the global economy, Finland's food products are competitive and sought after. There is an education and advice centre for organic farming where people share ideas and best practices (Social). International collaboration has led to an abundance of efficient solutions in farming to reduce water use, improve organic crop yields, and preserve phosphorous and in energy production and consumption (Techno-logical). By learning how to farm the forest, rich soil is preserved (Environmental). Because Finland is known for popular organic products, people want to visit the farms that produce their food—food tourism is popular (Cultural, Citizen, Consumer).

Black Swans and Their Implications

Group 4 came up with three imaginative Black Swans for their scenario and selected two of them for evaluation. The one they decided not to include is "Olympics or World Expo held in Finland in 2015," which makes sense because Expo 2015 is happening right now in Milano and the next three dates and host cities for the next three Olympics have already been set. (Interestingly enough, the topic of Expo 2015 is food.) The two Black Swans they selected are **"Animals and insects share products (hunting is possible)"** and **"Huge flocks of ducks visit farm and there is big hunting (like fishing on the bridge)."** Essentially, their Black Swans have to do with the new ways of producing food attracting an abundance of animals which then become more food.

The group imagines the downsides of these two Black Swans are "threats on the cultures", possibly referring to the food being grown in the forest or to people and communities, and "to limit the population," possibly referring to the need for hunting in contradiction to other aspects of the expanded empathy among species in the "new consciousness" scenario.

On the positive side, they list the opportunity for hunting as a means of food and recreation, being able to host an international bird hunting championship, having an Eco-Agriculture National Park, and the value of hand-labour in hunting food which leads to higher quality produce and meat.

Table 9. Black Swans and their implications as generated and identified in Group 4.

Black Swans
Item selected by group in bold.
1. Animals and insects share products (hunting is possible)
2. Huge flocks of ducks visit farm and there is big hunting (like fishing on the bridge)
3. Olympics / World Expo held in Finland in 2015
Impacts on our Scenario
Cons
Threat on the cultures.
To limit the population
Pros
Opportunity for hunting (food + recreation)
International bird hunting championship
Eco-Agriculture National Park
Hand-labour→ higher quality produce/meat can be expected.

Comments and Observations

Group 4 has selected an interesting lens for approaching the New Consciousness scenario. In any scenario, answering, "where does the food come from?" is quite relevant. It would be a bold and different world for a nation like Finland to be 100% organic. In light of global warming, temperatures will increase in the north potentially making Finland more ideal for farming. Bearing in mind that the four Neo-Carbon Energy scenarios as used in this Futures Clinique are all assumed to be transformational (meaning radical and fundamental changes), this idea of 100% organic Finland is appropriate in its radicalness, since at the moment it seems an improbable goal to achieve. It may even be more ambitious than to attempt a 100% renewable energy Finland for 2050. In analogy, the barriers for alternative food futures - as for energy - arise largely from political and industrial lobbies of established markets and positions. The change, however, may rather emerge from changed lifestyles and values nurturing clean and sustainable ways of life and industrial processes.

The idea of farming in the forests is an interesting angle to incorporate into the New Consciousness scenario – consulting writings about how it works and looking for case studies would help assess its plausibility. The forest could also be checked out as a potential space for other uses that are

not currently applied for it – e.g. housing or health care or even education. Farming in the forests might also be worked out into one branch of slow life movement. This might be one feature of "living with Nature" approach – drawing forest closer to living. There are detailed instructions for farmers of how to attract wildlife by careful planning, resorting to traditional skills and "back to basics" thinking. Thus, for example a backyard of a farm may be converted into a wildlife sanctuary (Gehring 2008, 442).

It is surprising how the group places emphasis on regulation instead of open market/industry evolution as the means by which this 100% Organic Food future comes to be. This emphasis on regulation may point to present day frustration with how slowly the organic food movement has taken hold and the need for some force to make it the norm instead of the niche.

This work is an example of deeply exploring one aspect of a possible future. While rich in detail on the chosen aspect of food, it at times feels a little too singular in focus, not taking into account wider factors such as why being 100% organic is competitive in a global marketplace and what other issues are intersecting with food such as water shortages, energy production, or military conflicts. Food, water, and energy nexus would be an excellent approach to elaborate this scenario.[23] In addition, it would also be interesting to study the topic further through the framework of 15 Global Challenges as presented by the Millennium Project (Glenn & Florescu 2015). The theme of food as one of the fifteen global challenges – and as focused further into 100% organic food - could be then addressed systematically in relation to the other fourteen global challenges.

Overall, Group 4 did a good job with the assigned tasks and produced a few new angles for Neo Carbon futures researchers to explore. Indeed, answering the question, "What will people eat?" is a relevant question in any possible future.[24]

Reading their descriptions, it seems reasonable that new consciousness world would inevitably rely on bio/organic farming! We also liked the group's argument that organic farming makes a country more competitive. This would be a win-win situation in terms of economy, environment, and national health. The top-down manifestation of this new food policy is thoroughly described, however what changes need to occur at the cultural level? Are eco-labels enough to promote organic food internationally? To achieve global 'New Consciousness', what types of influences would introduce populations, who do not already value it, to organic farming/eating?

[23] A recent Delphi study on this nexus of food, water and energy was conducted by the Millennium Project.

[24] Finland Futures Research Centre (FFRC) organised a whole conference on the topic of food in 2013 in Turku, Finland www.futuresconference.fi/2013.

2.5 Concluding Highlights in a GROUP PESTEC

In the following Futures Table, items circled by each group are presented in relation to the selections of the other groups. This side-by-side, group-to-group comparison brings our attention to the differences and similarities among the futures imagined by each group in this Futures Clinique. Because Group 2 and Group 4 chose New Consciousness as their Neo-Carbon scenario, they are shown near each other in the right two columns. In effect, each column is a different future image. In Scenario planning, a Futures Table can be used to analyse how divergent a set of scenarios is as a way to assess how well they cover the envelope of uncertainty. In other words, when a set of scenarios are extreme and different enough from each other they cover a wider range of possible futures, thereby providing greater value to decision-making (Ralston & Wilson 2006, 123).

Table 10. Group PESTEC highlighting key elements from all the groups.

2050	Group 1 **DIY Green Engineers + Built Environment**	Group 3 **"Techemoths" + Work**	Group 2 **New Consciousness + Living**	Group 4 **New Consciousness + Farming**
Political	Government subsidies to fund renewable energy hubs	Corporate structure same as political structure	Making political power of new movement	All the food in Finland is organic!
Economic	Businesses provide renewable energy technologies: Solar panels, wind power…	Hierarchical income equality	Shared economy = Libraries of Things & Services	Competitive. Food products in global market.
Social	Change of mindset in energy use	Out of job, out of hub, out of society	New type of education: Teaching about real world & connections of everything	Education & Advice Center for Organic Farming
Technological	Improvement of the battery technology	Self-efficient in energy	Durable Technology	International collaboration on better efficient solutions
Environmental	No worsening impact to greenhouse effect	Independent ecosystem	Media as info source, not only entertainment	Farm=Forest Rich Soil
Cultural	"Green Cities"	Strong loyalty towards Hub	Change of mindset => New Values Services Providing Spiritual Satisfaction Instead of Materialistic	Finland known for popular organic products —> tourism

For example, in the row for Social, all items but Group 3's have to do with education. However, these items take different forms – Group 1 lists a change in mindset for which education would be a

driver, Group 2 lists new types of education, and Group 4 lists education programs for farmers. In the technological row, Group 2 and Group 3 elevate the importance of energy efficiency (reducing energy waste), while Group 1 is focused on storage and Group 4 is focused on durability (reducing electronic waste).

Further comparison could be made by extrapolating driving forces from each item in a row. Doing so allows for the scenario creator to imagine how a force found important for one group's future image would be important for another group's future image. Table 11 is a model for how driving forces could be extrapolated from Political row of Table 10.

Table 11. Model of Extrapolated Driving Forces.

	Extrapolated Driving Force	Group 1 Green DIY Engineers + Built Environment	Group 3 Techemoths + Work	Group 2 New Consciousness + Living	Group 4 New Consciousness + Farming
Political	**Government Subsidies for Energy**	*Government subsidies to fund renewable energy hubs.*			
	Dynamic between corporations and governments		*Corporate structure same as political structure.*		
	Influence of new grassroots political movements			*Making political power of a new movement*	
	Support for sustainable agriculture				*All food in Finland is organic!*

Extrapolating these driving forces, allows scenario creators to cross-pollinate the ideas from the four groups and generate new details for all of the scenarios. For example, using these extrapolated driving forces, Group 3 would be able to add depth to their scenario by imagining what government subsidies for energy, the dynamic between corporation and governments, and support for sustainable agriculture would look like in their future world. These cells are left blank in the model table to provoke new ideas. When filled in, the new table would assist the scenario writer in incorporating dimensions considered in the other scenarios of the set. Furthermore, this method of extrapolating driving forces across various group works could serve as a means by which to integrate the Futures Tables produced by all Neo-Carbon Futures Cliniques.

3. CONCLUSION

To conclude, it is evident that in a futures exercise like this, the starting point was very open and inviting for ideation. Especially bold long-term thinking and holistic view was called for in the Futures Provocation (= lecture before the Futures Clinique). The students had the freedom to make their own choices concerning the key topic to be discussed. They also were able to choose one of the four Neo-Carbon Energy scenarios that they were most interested in for their work. Choosing these variables increased participant motivation for the futures tasks. It was interesting to note that out of the four scenarios available, three were taken into elaboration while only "Radical Startups" was left out. As a result, the most transformational of the four transformational scenarios, "New Consciousness", was taken as the scenario in two separate groups. This illustrates that the set of four Neo-Carbon Energy scenarios is interesting at the outset and provide different approaches with approximately equal interest. These aspects are quintessential in all scenario work: all the scenarios produced in a foresight exercise or project must be inspiring, interesting, intriguing, and differ from each other sufficiently to bring about different elements for different worlds in the future.

Overall, we are pleased with the outcomes of ***Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds*** Futures Clinique and have discovered some new angles to consider in the Neo-Carbon scenarios. We encourage the students who participated or any others who have read this report, to contact FFRC with any further thinking, signals, or other new thoughts they have about the outcomes reported here.

Continuous Transformation Course and this Futures Clinique conducted for the course draw attention both to the concept of transformation as well as to anticipating and understanding transformation. Transformation frequently includes challenges, risks and threats, but it may also mean opportunities. Jacobs (2015, 70) depicts how today humanity[25] confronts multidimensional challenges of unprecedented magnitude, complexity and consequences for current and future generations. He further points out how the intensity and urgency of these challenges are multiplied by rapid globalization, accelerating pace of social change, exponential rates of technological innovation, as well as the extensive web of inter-linkages and interdependencies between people, institutions and aspects of life all over the world and all the time. He also perceives this period as full of unparalleled opportunities for humanity owing to global spread of democracy and human rights, rising level of education, and other catalytic drivers. Like Olsson et al. (2014) argue, the problem is not a lack of individual and societal innovative and transformative capacity, but how these capacities can be used. The outcome

[25] Slaughter (1999, 149) reminds us that humanity is not a monolithic whole, but a "deeply divided and incredibly diverse family of beings with profoundly unequal access to wealth, power and autonomy".

of transformation as the consequences of these challenges and opportunities will depend on the way we respond to them. A genuine transformation has people and their interaction in its core and leads to changes in power relations in multiple levels. Therefore, futures studies is critical in showing possible futures images, scenarios and outcomes of transformation to support decision-making and choices on what are desirable futures and what measures should be taken to hinder or eliminate the undesirable transformational elements and to systematically and proactively promote the preferred ones. Slaughter (1999, 149) summarises this as the promise of the field of futures studies: "it gives to humanity the tools by which to choose future states worth creating and to put in train the means by which to achieve them". According to Dator (2012) the main goal of futures studies is to make preferred social change happen.

Futures Clinique is ultimately a process for futures learning (Heinonen & Ruotsalainen 2013b). Profound learning fundamentally comprises sense-making – i.e. understanding elements, topics and entities within the learning sphere. Futures learning at its best means sense-making of the anticipated change and transformation. Kezar (2015, 763) goes further by making a distinction between sense-making and sense-giving. She claims that sense-making is about creating an understanding of the change while sense-giving is concerned with influencing the outcome. In futures studies, Bell (1997, 95–97) lists "communicating and advocating a particular image of the future" as one of the nine major purposes for futures studies.[26] Futures Clinique is an appropriate tool for first opening up avenues of possible futures as a result of co-creative brainstorming and interaction, to be then judged in terms of their desirability as societal change. Such foresight will then lead to sense-giving to futures images and call to action not just as food for thinking but also to direct decision-making at various levels. This is in line with Bell's definition of the aim of futurists to be to contribute to human betterment by translating knowledge and values into action.

Cities and communities are pivotal in making shift towards sustainable futures as continuous transformation. The concept of eco-cities has promoted the building of cities in balance with nature (Register 2006). Yet, much more systematic efforts are still needed for livable and eco-smart low-carbon, post-carbon and neo-carbon cities (Heinonen 2013). Futures studies gives us the approach of systems thinking, complexity thinking and urge to look beyond linearity and conventional harmful practices. True transformation arises from the concept of responsible regeneration along such proactive lines of thought. Re-building our cities and communities through regenerative urbanism (Girardet 2015) also means continuously innovating neo-growth futures.

[26] Bell (1997, 96) gives as an example the authors of the recognized Club of Rome report "Limits to Growth" who construct and communicate images of global overshoot and collapse, while advocating policies to prevent such images from becoming a reality.

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APPENDIX 1

Introduction to Neo-Carbon Energy 2050 Energy Sketches

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Finland Futures Research Centre 22.5.2015
DRAFT TO BE ELABORATED IN NEO-CARBON ENERGY PROJECT

This text is an introduction to the four preliminary scenarios of Neo-Carbon Energy world in 2050. The scenario sketches have been formed using two axes and their opposite values (see table 1). The X axis is called "Peer-to peer" and its values are Corporate ("centralised") peer-to-peer and Neo-Communal (distributed) peer-to-peer. The Y axis is called "Ecological awareness" and its values are Pragmatic ecology and Deep ecology. Out of these two axis and their opposite values four initial scenarios have been formed. The scenarios are summarized in the below fourfold table (table 1).

In each of the scenarios energy is produced mainly in wind and solar farms and used locally in the form of synthetic methane. However, the energy solutions and business practices can vary from scenario to scenario, and the neo-carbon (wind, solar, methane) system be realized in different ways. The scenarios are tentative, and intended to be complemented, tested and elaborated throughout the Neo-Carbon Energy project.

Table 1. Four transformative scenarios.

TRANSFORMATIVE SCENARIOS 2050 FOR NEO-CARBON ENERGY

Ecological awareness	Corporate ("Centralized" peer-to-peer)	Peer-to-peer	Neo-Communal (Distributed peer-to-peer)
Deep ecology	**Radical startups** Society is business-oriented, but economy is driven by a multitude of small-scale startups known for their "radical" values and approaches. Environmental problems are solved commercially. Businesses are drivers of new, ecologically oriented lifestyles.		**New consciousness** Deep ecological values and distributed models have led to altogether new kind of consciousness and worldview. Environmental problems are not seen as practical issues but calling for deeper changes in values and mindsets.
Pragmatic ecology	**Value-driven "Techemoths"** Peer-to-peer approaches are common, but they are practiced in more or less traditional organisations. Markets take care of environmental issues.		**Green DIY Engineers** Engineer-oriented citizens have organized themselves as local communities to survive ecological collapse. Environmental problems are solved locally, with a practical mindset.

Axes of the scenarios – setting the stage

Peer-to-peer refers to models of organisation where equal individuals arrange their joint efforts in cooperation without involment of hierarchical structures such as governmental organisations or companies. In other words it is an bottom-up, grassroots approach as compared to up-bottom, bureaucratic approach.

In practice peer-to-peer can mean for instance social media networks, open source programming communities, grassroots political movements and citizen activism, consumer movements and co-working spaces. A central concept related to peer-to-peer is *prosumerism* (producer + consumer), which refers to consumers/citizens turned to active (free-time) producers.

Internet is basically a peer-to-peer infrastructure: It is a network of networks and doesn't have a governing centre. Different actors are at least in principle equal power-wise, and for instance in social media individuals often have more power than large companies. Internet consists of individuals linked to each other; its social mode can be called *networked individualism.*

It is often assumed that the more dominant and pervasive internet becomes in society, the more prevalent and common peer-to-peer approaches grow – this is called the *network society*. In a network society basically everything is in one way or another organised around peer-to-peer networks.

Traditionally the energy sector has been a very centralised business. Non-renewable energy sources are not evenly distributed and their harnessing and utilization has required notable resources. However, renewable energies, especially solar and wind, are relatively evenly distributed and their harnessing and utilization is also relatively cheap – and the costs are decreasing fast.

The combination of solar, wind and smart electricity grids allow an distributed energy system, where energy is produced peer-to-peer, and where traditional energy companies lose their stance. Because energy is such a fundamental sector in society, peer-to-peer energy production would a central part for the foundation of a peer-to-peer (network) society – it could steer societal values heavily towards grassroots approaches in general.

In the 2050 societal scenarios of the Neo-Carbon project, peer-to-peer is assumed two opposite variants (=extreme ends of scenario axis)

- Corporate peer-to-peer ("centralised"): people self-organise freely, but **within large organisations**. Organisations are **enabling platforms** for individuals' peer-to-peer formations, **providing resources and facilities**. Hierarchic structures have been replaced with egalitarian ones.
- Neo-communal peer-to-peer (distributed): People organise their joint efforts independently. They form grassroots communities, **based on shared values and interests**. Often these communities develop into businesses. Peer-to-peer formations are more numerous and widely distributed than in the corporate peer-to-peer model.

Ecological awareness axis refers to a situation where ecological values and lifestyles have become the norm in society. By ecological values is meant values that acknowledge the primality of the wellbeing of ecosystems.

In the 2050 societal scenarios of the Neo-Carbon project, this axis is assumed two opposite variants

- Deep ecology: an ecological and environmental philosophy advocating the inherent worth of living beings regardless of their instrumental utility to human needs. The natural world is seen as a subtle balance of complex inter-relationships in which the existence of organisms is dependent on the existence of others within ecosystems.
- Pragmatic ecology: acknowledges the great importance environmental issues, but mainly in relation to human wellbeing and survival. Concrete results are prioritized, without necessarily any deeper worldview – except for utilitarianism – guiding actions. **Nature is seen first and foremost as resources to be utilized by humans – nature is seen as valuable because of the benefits it offers to humans**.

SCENARIO 1: Radical Startups (Corporate Peer-to-Peer & Deep Ecology)

Society is business-oriented, but economy is driven by a multitude of small-scale startups known for their "radical" values and approaches. Their selling point is promising to do societal and environmental good. Environmental problems are solved first and foremost commercially. Businesses are drivers of new, deep-ecologically oriented lifestyles.

Key trend in the present: In a networked economy small and medium enterprises are increasingly responsible for creating value and growth. Innovations stem from startup enterprises. Consumers' needs are diversifying and fragmenting, and startups can often supply these niche markets better than large, rigid enterprises. Startups are also vanguards of a new working culture, where expressing oneself through work becomes an important motivator.

In an ecological transition where everything is to be transformed as ecologically "smart", diverse ecosystems of startups are needed to make the change possible.

http://www.e-architect.co.uk/images/jpgs/barcelona/fab_lab_house_p200710_ag8.jpg

Figure 1. Radical Startups scenario.

SCENARIO 2: Value-Driven Techemoths (Corporate Peer-to-Peer & Pragmatic Ecology)

Peer-to-peer approaches are common, but they are practiced within large corporations. These "techemoths" represent the Silicon Valley vision of emancipation, creativity and open source. The vision is, however, somewhat self-contradictory. Techemoths cherish the "libertarian" hacker ethos, but at the same time form totalities that confine their employees tightly within corporate walls.

In this scenario, markets take care of environmental issues. Techemoths invest in ambitious energy & technology projects.

Key trend in the present: Google, Facebook, Apple and other technology giants are developing their headquarters as campuses offering all the basic amenities from housing to leisure to education. This could lead to "corporate villages" where people live most of their lives without any need to step outside corporate properties. Corporate cultures could become a central part of peoples' identities and lifestyles. Companies would offer such benefits – material, immaterial, and social – that people would prefer living within them.

Figure 2. Corporations' headquarters provide facilities for peer-to-peer projects. They are often located outside cities and are self-sufficient.

SCENARIO 3: Green DIY Engineers (Neo-Communal Peer-to-Peer & Pragmatic Ecology)

The world has faced an ecological collapse. Engineer-oriented citizens have organized themselves as local communities to survive. Environmental problems are solved locally, with a practical mindset. Nation states and national cultures have more or less withered away. As global trade has plummeted, communities have to cope with mostly low-tech solutions.

Key trend in the present: If the current development continues, the effects of climate change will be dramatic. This can already be seen in the recent draughts of California, which some believe could even lead to the "End of California". Global climate turmoil could bring about a world in which local communities would struggle in cooperation to survive. Even before a global environmental crisis the first signs of the turmoil could make communal living and a survivalist spirit intimidating.

http://jason.wells.me/wp-content/uploads/2012/05/burning_man_2002_Robotic_Rickshaw.jpg

Figure 3. Green DIY Engineers scenario.

SCENARIO 4: New Consciousness (Distributed/Neo-Communal Peer-to-Peer & Deep Ecology)

In the "New Consciousness" scenario, a looming ecological crisis, "World War III" of numerous small hybrid warfare conflicts, and ubiquitous ICTs have led to a new kind of consciousness and worldview altogether. Values of deep ecology have become the norm. People do not conceive themselves as separate, self-profit seeking individuals, but deeply intertwined with other humans and with nature. Phenomena are conceptualized and understood from a systems-oriented worldview, which sees "everything connected to everything else" – as parts of a single, global system. "Society" is organised as open global collaboration and sharing of resources and information.

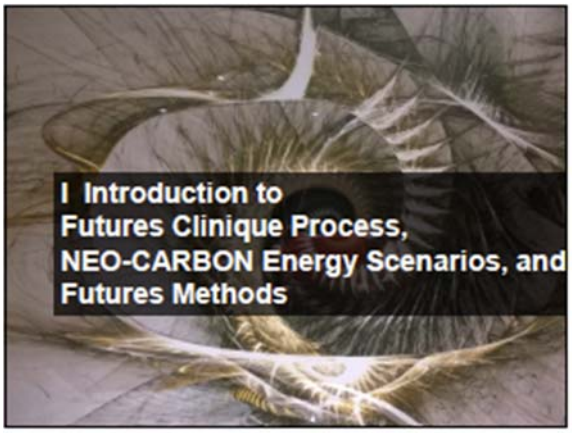
Key trend in the present: On social media people express their individual identities, but at the same time are in constant interaction with each other. Identities are increasingly built on information streams of the internet – which are in definition shared and social. Mobile and wearable computing only enforces this trend, as people are connected to others practically all their waking hours. This could lead to a "new consciousness" where people do not see themselves as separate individuals but deeply connected to each other.

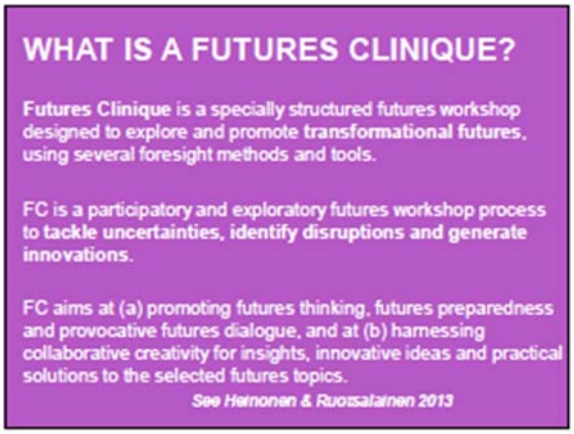
© http://www.wired.com/2014/11/thierry-cohen-darkened-cities/

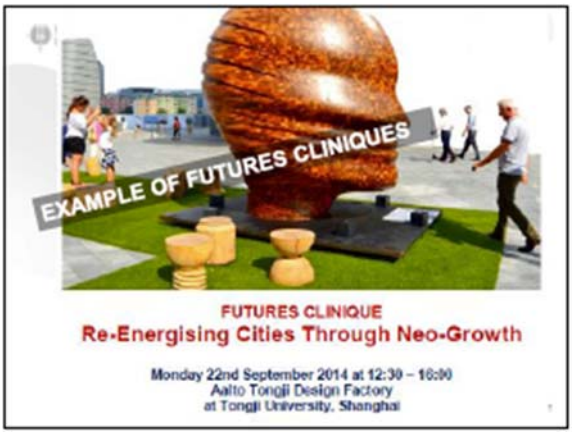
Figure 4. New Consciousness scenario.

APPENDIX 2

Futures Clinique Lecture by Sirkka Heinonen







This Futures Clinique at Aalto is related to NEO-CARBON ENERGY PROJECT

financed by Tekes new strategic openings, and to its futures-oriented WP1 "Neo-Carbon Enabling Neo-Growth Society – Transformative Energy Futures 2050", conducted at Finland Futures Research Centre, University of Turku in co-operation with VTT and Lappeenranta University of Technology LUT.

FUTURE AS ASPIRATION

MAIN TASK OF FUTURES STUDIES

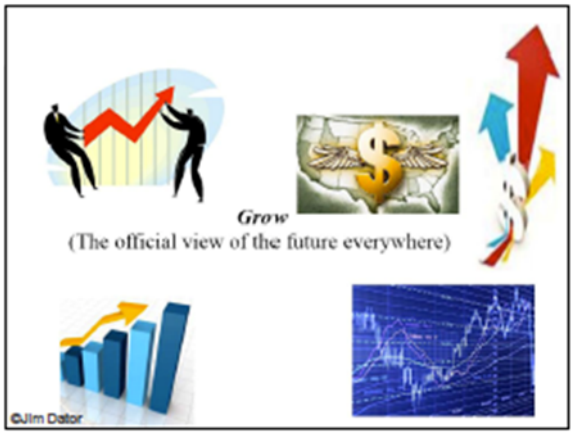
- is to empower social change by liberating our thinking about alternative futures
- The most important quest for futures studies is to invent ***preferred***, aspirational futures

Prof. Jim Dator, Hawaii University

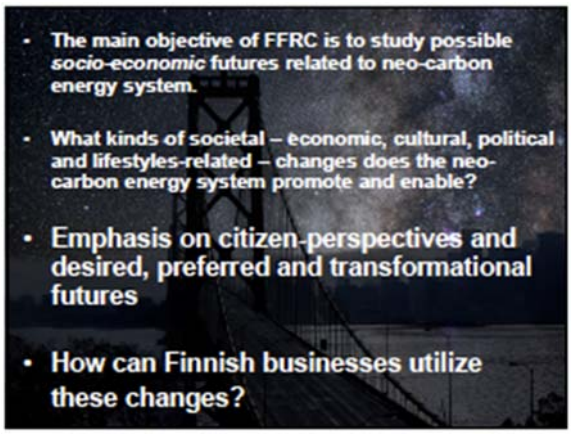
Four Generic Alternative Futures

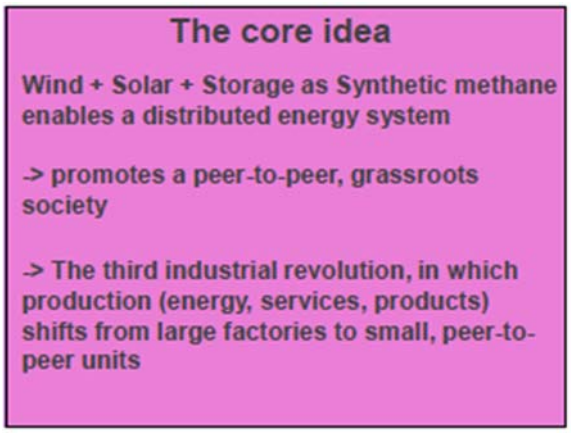
1. Continued Growth
2. Collapse
3. Disciplined Society
4. Transformational Society

©Jim Dator

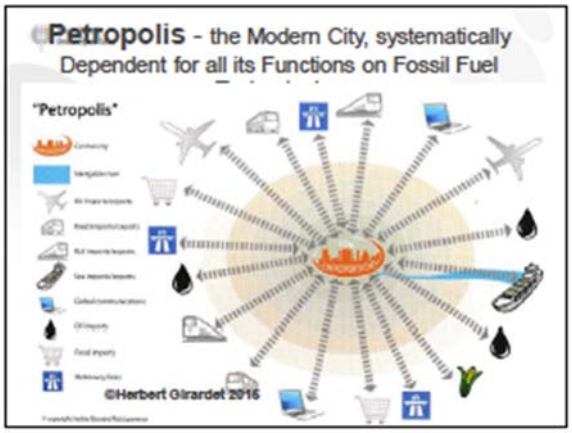


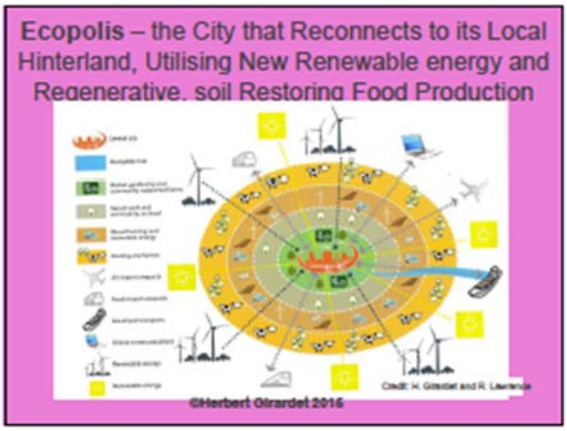

Transformative Energy Futures 2050
(all transformative!
all based on renewable energy!)
Neo-Carbon Enabling
Neo-Growth Society
Neo-Growth -> What kind of growth we want?
Neo-Carbon -> How carbon emissions can be reduced and used as a resource?
Third Industrial Revolution
Prosumerism
Peer-to-peer society

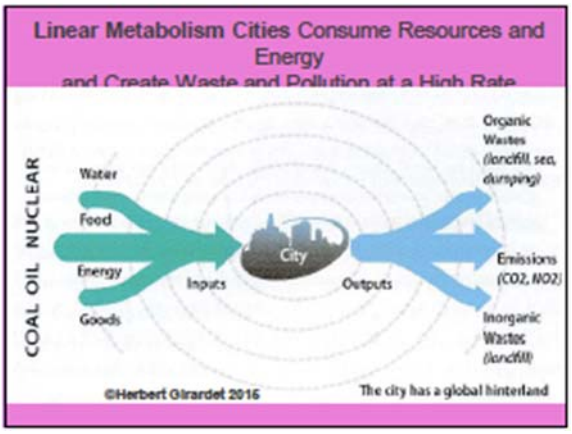

The main objective of FFRC is to study possible socio-economic futures related to neo-carbon energy system.
What kinds of societal – economic, cultural, political and lifestyles-related – changes does the neo-carbon energy system promote and enable?
Emphasis on citizen-perspectives and desired, preferred and transformational futures
How can Finnish businesses utilize these changes?

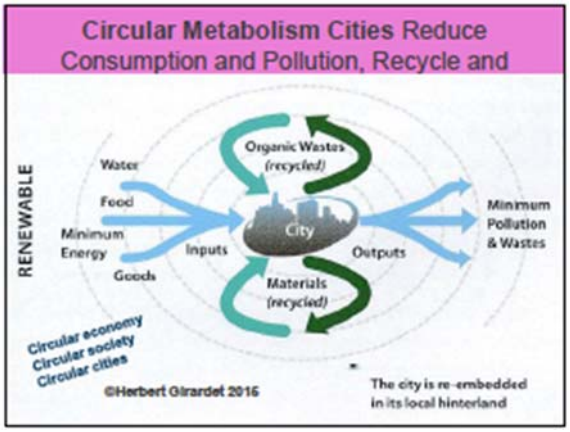

The core idea
Wind + Solar + Storage as Synthetic methane enables a distributed energy system
-> promotes a peer-to-peer, grassroots society
-> The third industrial revolution, in which production (energy, services, products) shifts from large factories to small, peer-to-peer units

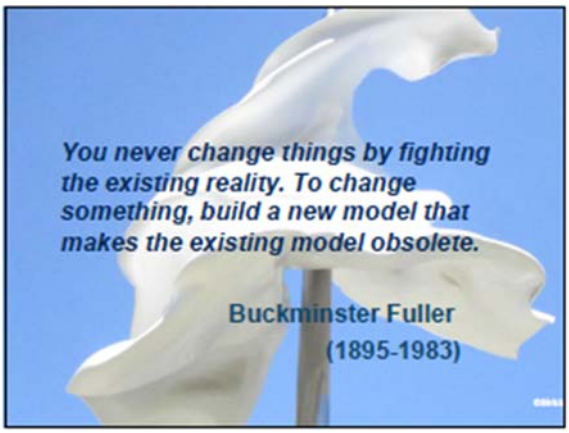

Third Industrial Revolution
1. Shifting to renewable energy
2. Transforming the building stock of every continent into green micro-power plants to collect renewable energies on-site
3. Deploying hydrogen and other storage technologies in every building and throughout the infrastructure to store intermittent energies
4. Using Internet technology to transform power grid of every continent into an energy internet that acts just like the Internet
5. Transitioning the transport fleet to electric plug-in and fuel cell vehicles
©Jeremy Rifkin

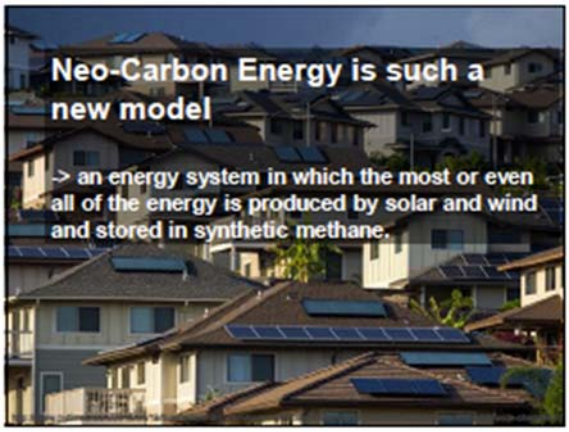

Petropolis - the Modern City, systematically Dependent for all its Functions on Fossil Fuel
"Petropolis"
©Herbert Girardet 2016

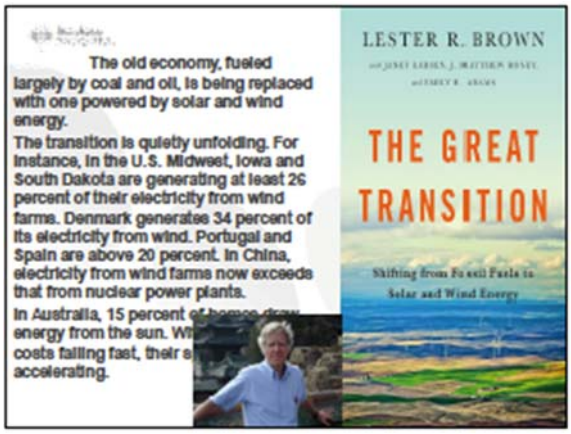

Ecopolis – the City that Reconnects to its Local Hinterland, Utilising New Renewable energy and Regenerative, soil Restoring Food Production
©Herbert Girardet 2016

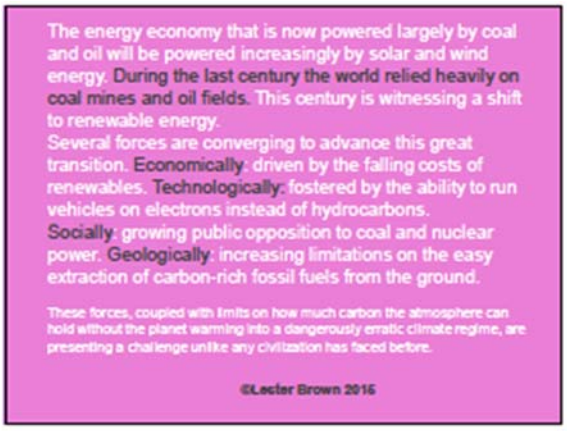

Linear Metabolism Cities Consume Resources and Energy
COAL OIL NUCLEAR
Water
Food
Energy
Goods
Inputs
City
Outputs
Organic Wastes (landfill, sea, dumping)
Emissions (CO2, NO2)
Inorganic Wastes (landfill)
©Herbert Girardet 2016
The city has a global hinterland

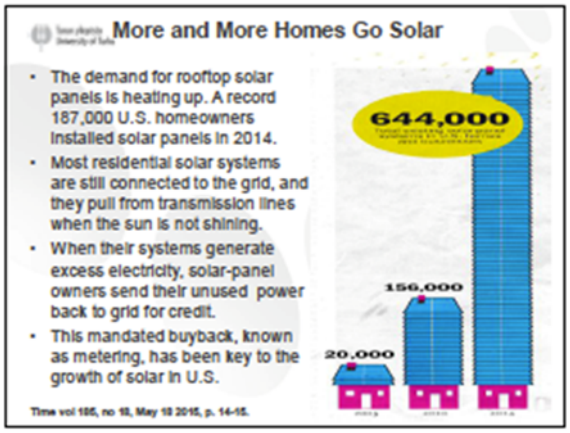

Circular Metabolism Cities Reduce Consumption and Pollution, Recycle and
RENEWABLE
Water
Food
Minimum Energy
Goods
Inputs
City
Outputs
Organic Wastes (recycled)
Materials (recycled)
Minimum Pollution & Wastes
Circular economy
Circular society
Circular cities
©Herbert Girardet 2016
The city is re-embedded in its local hinterland


You never change things by fighting the existing reality. To change something, build a new model that makes the existing model obsolete.
Buckminster Fuller
(1895-1983)

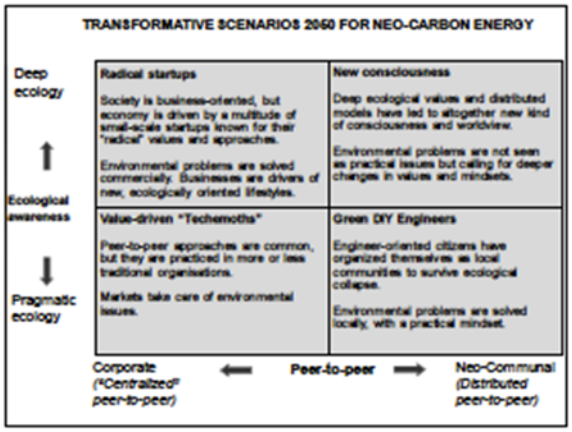

Neo-Carbon Energy is such a new model
-> an energy system in which the most or even all of the energy is produced by solar and wind and stored in synthetic methane.


The old economy, fueled largely by coal and oil, is being replaced with one powered by solar and wind energy.
The transition is quietly unfolding. For instance, in the U.S. Midwest, Iowa and South Dakota are generating at least 26 percent of their electricity from wind farms. Denmark generates 34 percent of its electricity from wind. Portugal and Spain are above 20 percent. In China, electricity from wind farms now exceeds that from nuclear power plants.
In Australia, 15 percent of homes draw energy from the sun. Wi
costs falling fast, their s
accelerating.
LESTER R. BROWN
THE GREAT TRANSITION
Shifting from Fossil Fuels to Solar and Wind Energy


The energy economy that is now powered largely by coal and oil will be powered increasingly by solar and wind energy. During the last century the world relied heavily on coal mines and oil fields. This century is witnessing a shift to renewable energy.
Several forces are converging to advance this great transition. Economically: driven by the falling costs of renewables. Technologically: fostered by the ability to run vehicles on electrons instead of hydrocarbons.
Socially: growing public opposition to coal and nuclear power. Geologically: increasing limitations on the easy extraction of carbon-rich fossil fuels from the ground.
These forces, coupled with limits on how much carbon the atmosphere can hold without the planet warming into a dangerously erratic climate regime, are presenting a challenge unlike any civilization has faced before.
©Lester Brown 2016


More and More Homes Go Solar
The demand for rooftop solar panels is heating up. A record 187,000 U.S. homeowners installed solar panels in 2014.
Most residential solar systems are still connected to the grid, and they pull from transmission lines when the sun is not shining.
When their systems generate excess electricity, solar-panel owners send their unused power back to grid for credit.
This mandated buyback, known as metering, has been key to the growth of solar in U.S.
644,000
156,000
20,000
Time vol 185, no 18, May 18 2015, p. 14-15.


BACKGROUND
This transformation is studied through four scenarios to be elaborated during the project
1) Radical Startups
2) Value-Driven "Techemoths"
3) Green DIY Engineers
4) New Consciousness


TRANSFORMATIVE SCENARIOS 2060 FOR NEO-CARBON ENERGY
Deep ecology
Ecological awareness
Pragmatic ecology
Radical startups
Society is business-oriented, but economy is driven by a multitude of small-scale startups known for their "radical" values and approaches.
Environmental problems are solved commercially. Businesses are drivers of new, ecologically oriented lifestyles.
New consciousness
Deep ecological values and distributed models have led to altogether new kind of consciousness and worldview.
Environmental problems are not seen as practical issues but calling for deeper changes in values and mindsets.
Value-driven "Techemoths"
Peer-to-peer approaches are common, but they are practiced in more or less traditional organisations.
Markets take care of environmental issues.
Green DIY Engineers
Engineer-oriented citizens have organized themselves as local communities to survive ecological collapse.
Environmental problems are solved locally, with a practical mindset.
Corporate ("Centralized" peer-to-peer)
Peer-to-peer
Neo-Communal (Distributed peer-to-peer)


RADICAL STARTUPS

Society is organized as horizontal peer-to-peer networks. These networks take place in numerous small and medium-sized enterprises.

Enterprises have become the places where people can best express themselves and do things that are meaningful to them.

Startups are advocates for a deep ecological worldview.

ENERGY IN THE RS SCENARIO

- Energy is produced in clusters of startups, mainly wind & solar. The energy system has been achieved through startup innovations, there are no subsidies.
- Biomass is used as little as possible – at least no forests are harvested for biomass.
- Demand for energy is relatively high, but ubiquitous smart technologies and solutions provided by startups mitigate consumption.
- Built environment optimizes its energy flows efficiently. Energy consumption is thoroughly monitored. However, ubiquitous ICTs themselves use a lot of

VALUE-DRIVEN "TECHEMOTHS"

Internet and consumer electronic behemoths such as Google, Facebook and Apple have become the centres of power in society.

They are almost self-sufficient entities, and their office buildings like cities: workers live most of their lives within corporate properties.

Techemoths are platforms providing resources for workers' peer-to-peer

ENERGY IN VALUE-DRIVEN TECHEMOTHS

- Tech companies develop "futuristic" energy technologies and produce energy, mainly in solar & wind. Biomass is also used.
- Energy solutions vary from company to company.
- Demand for energy relatively high, but ubiquitous smart technologies mitigate consumption – but consume energy themselves.
- **Inequality causes waste of energy, e.g. as infrastructure is often in a relatively poor condition outside tech campuses. "Smart technologies" are unevenly distributed.**

GREEN DIY

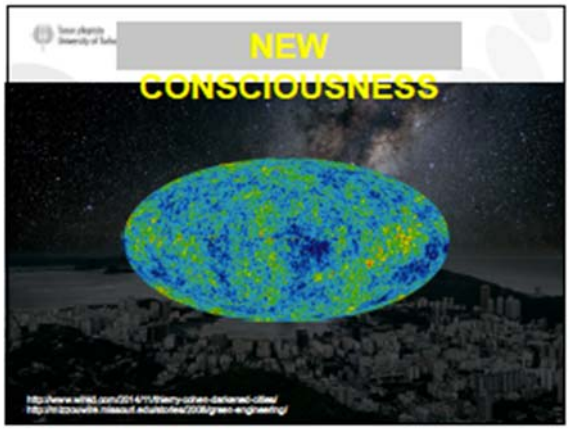
The world has faced an ecological collapse due to the combination of rampant climate change and species extinction.

To survive, engineer-oriented citizens have organized themselves as local communities.

Practical mindset is highly valued, and engineer is the "ideal citizen" in society.

ENERGY IN GREEN DIY ENGINEERS SCENARIO

- Local wind, solar & biomass are the main sources of energy. Energy is used as little as possible.
- Energy solutions vary greatly from community to community. Some communities are off-grid. Energy technologies have to be built using local resources mainly.
- Scarcity drives towards more diverse energy pallet compared to other scenarios.
- Local democracy ensures rational decisions and



Collective consciousness started to transform radically in the second decade of the 21st century.

The shift in consciousness was caused by three factors

1) **The surprisingly early turmoil caused by the climate change (such as the dramatic draught in California in 2010's)**
2) **"World War III" of numerous relatively small conflicts – especially Russian's "hybrid warfare" and hostilities by ISIS and other extremist groups**
3) **Ubiquitous ICTs: constantly connected to the internet, people began to see their identities as shared and collectively constructed**

The new consciousness, based on the notion of the unity of all living beings, has led to drastic improvements in the state of the environment and social ills.

A real world village and a "hi-tech socialist utopia".

ENERGY IN NC SCENARIO

- Solar & wind on a very local level - **energy is harvested from everywhere**. Biomass as little as possible – no forests harvested. Distribution through a global super-grid.
- **Technology** development and production funded and conducted by global joint efforts.
- Demand for energy is high. The main reasons for high energy consumption: global scale (transportation and travelling) and highly sophisticated virtual realities.
- **Citizens are extremely committed to energy decisions & policies. Energy is a deeply personal issue.**

Sessions in Groups in Futures Clinique

Futures Window as Food for Ideas

Main Topics chosen to form Groups

Session 1: **Futures Wheel**

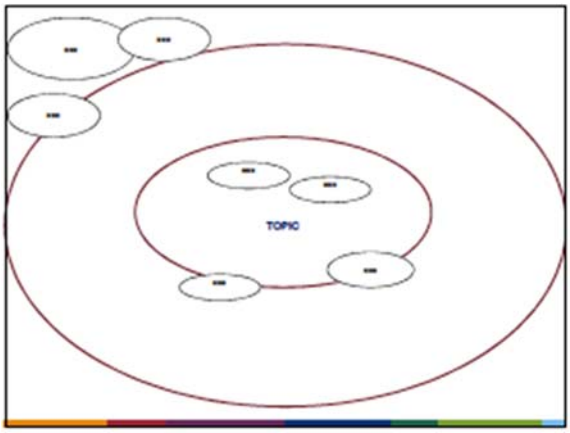
Session 2: **Futures Table PESTEC**

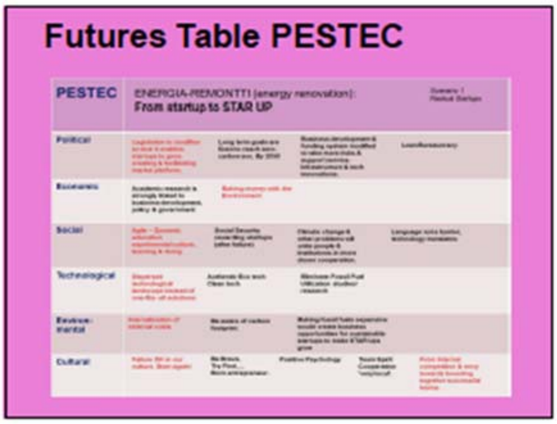
Session 3: **Black Swans**

Session 4: Presentation and Cross-Fertilization

Futures Wheel

developed by Jerome Glenn/Millennium Project





PESTEC	TOPIC (chosen idea or innovation to be elaborated in PESTEC dimensions)
Political	Text box
Economic	
Social	
Technological	
Environ-mental	
Cultural	

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APPENDIX 3

Group Work Instructions

Aalto University/Continuous Transformation Course/Neo-Carbon Futures Clinique 22.5.2015
Sirkka Heinonen, Finland Futures Research Centre,University of Turku

"Creatively Sustainable Built Environment in Neo-Carbon Energy Worlds"
Groups to be formed around topics (food etc). The topics can be taken from the previous work of the students in this course. Each group then elaborates 1) its own topic + 2) renewable energy + 3) one chosen scenario of Four Transformative Neo-Carbon Scenarios.

Session 1: Futures Wheel (appx. 45 minutes)
In this session the group discusses and elaborates their topic + renewable energy + the scenario in general terms using a futures wheel.

Write down to post it pads, by yourself, a few ideas the scenario evokes in you in relation to your topic (food, housing, work etc). After you have presented your ideas to others in the group, place the post-its to the inner circle of the futures wheel. Write down your ideas to post it pads (preferably with more than one or two words!) and place them on the inner circle. After the inner circle, discuss the scenario in more concrete terms with your group. What could the ideas of the inner wheel mean in practice? E.g. what kind of businesses, services or products could come out of them? Again, write down your ideas to post its and place them to the outer circle. After both circles have been finished, choose with your group one idea/a group of ideas from the two circles of the wheel. Which of the ideas are the most interesting or relevant (pick one idea or a cluster of more idea).

Session 2: PESTEC Futures Table (appx. 1 hour)
First, choose the geographical context: Finland, China, Argentina, South Africa...In this session the group elaborates the chosen idea / ideas from the futures wheel to fit into **the Finnish/ChinaArgentina or ... context – what kind of society would you choose for the country be like in 2050**. This is done by filling a PESTEC table (P=political, E=economic, S=social, T=technological, E=environmental, C=Cultural/citizen/customer).

Discuss with your group the chosen idea/ideas through each of the PESTEC dimensions. What are the political, economic, social, technological, environmental and cultural implications of the chosen idea/ideas for your chosen country? What innovations could be generated? E.g. what political measures would the idea/ideas require, how would they affect the country's economy or what economic opportunities rise from it/them etc. Again, the one who presents an idea, writes it down on a post it and places it to the table.

Session 3: Black Swans (appx. 30 minutes)
In this session, the group discusses possible Black Swans (= sudden, unlikely events with radical impacts, the event can be either catastrophic of beneficial) and picks up one for further analysis. This chosen Black Swan is then reflected on the world they have been sketching in PESTEC (topic + renewable energy + group's chosen key idea/innovation) + group's scenario. The group anticipates the impacts from the Black Swan on their scenario (positive or negative impacts). Does the scenario suffer or perhaps gain from the Black Swan event and how?

Session 4: Presentation and Cross-Fertilization
Each group presents to other groups the idea they have chosen from the futures wheel to the PESTEC as well as the Black Swan and its impact on their scenario.

APPENDIX 4

Participants in the Futures Clinique

MUO-E8002 – Continuous Transformation

Leader: Tiina Laurila, Aalto University

Name		Discipline
Alsins	Arturs	Real Estate
Autio	Panu	Real Estate
Casalegno	Oona	Design
Clutterbuck	Andrew	Design
Du	Yuexin	Design
Duöng	Thi Lap	Business
E	Hengjia	Design
Fatima	Zarrin	Real Estate
Fotouhi	Fahimeh	Architecture
Frilander	Oona	Business
Hector	Philip	Design
Hernandez Gazga	Salvador	Architecture
Herold	Lee	Design
Hooey	Kieran	Real Estate
Huang	Xing	Architecture
Hylerstedt	Richard	Design
Kang	Kwangsun	Architecture
Karlsson	Paula	Design
Kojo	Ulpu	Architecture
Kolehmainen	Mirka	Design
Leino	Petra	Design
Leppänen	Anni-Katriina	Design
Leung	Benjamin	Business
Mostafa	Gaspar	Design
Nguyen	Thuy Trang	Business
Ohotnikova	Ekaterina	Design
Palarie	Dan	Architecture
Singh	Anuj	Business
Tseng	Tsui-Fan	Business
Vargas	Maritere	Design
Varjus	Anna-Kaisa	Design
Varnai	Anna	Design
Voipio	Elina	Business
Youn	Byungmin	Architecture

RECENT FFRC eBOOKS

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8/2015 Aho, Samuli & Kaivo-oja, Jari: Intian ja Kiinan hiilidioksidipäästöjen tulevaisuus 2020. Ympäristötaloudellisen Kuznets-käyräteorian testaus ja ennusteisiin tähtäävä aikasarja-analyysi.

7/2015 Kuhmonen, Tuomas – Hyvönen, Katja – Ahokas, Ira – Kaskinen, Juha & Saarimaa, Riikka: Paikallinen ruoka ja kestävä kehitys. Kirjallisuuskatsaus.

6/2015 Heinonen, Sirkka – Karjalainen, Joni & Ruotsalainen, Juho: Towards the Third Industrial Revolution: Neo-Carbon Energy Futures Clinique I.

5/2015 Karhunmaa, Kamilla – Pitkänen, Outi & Tuominen Visa: Assessing the co-benefits of house hold energy technology carbon offset projects.

4/2015 Heinonen, Sirkka & Ruotsalainen, Juho: KUDOS – Median ja journalismin viriäviä tulevaisuuksia, MEDEIA-hankkeen loppuraportti.

3/2015 Taylor, Amos – Heinonen, Sirkka & Ruotsalainen, Juho: Highlighting Media & Journalism Futures 2030. Survey on Weak Signals and Emerging Issues.

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17/2014 Kuhmonen, Tuomas: Maaseudun liiketoiminnan uudistuminen. Evolutionäärisen taloustieteen viitekehys.

16/2014 Heinonen, Sirkka & Ruotsalainen, Juho: Uusi journalismi? MEDEIA-hankkeen Tulevaisuusklinikka II 23.10.2014.

FFRC eBOOK 10/2015

Heinonen, Sirkka & Balcom Raleigh, Nicolas

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