

## **Expert opinion by the “Conseil supérieur pour un développement durable” on the strategic study « Third Industrial Revolution »**

as adopted by the Council in its plenary session of septembre 18<sup>th</sup>, 2017

### **Table of Contents**

#### **Part I**

- 1. Executive Summary**
- 2. General Remarks**
- 3. Key Challenges and Considerations**
  - 3.1. Luxembourg’s Financial Dilemma**
  - 3.2. Luxembourg’s Disproportionate Footprint**
  - 3.3. Climate Divide**
  - 3.4. Social Justice**
  - 3.5. Inter-generational / Loss of Human Capital**
- 4. Future Process and Implementation**
  - 4.1. Education**
  - 4.2. Good Governance**
  - 4.3. Food**
  - 4.4. The Healthcare Sector**
- 5. Conclusions and Open Questions** (require responses)

#### **Part II**

- 6. Sector Breakdown**

*TIRLux background*

  - 6.1 Energy
  - 6.2 Mobility
  - 6.3 Buildings
  - 6.4 Industry
  - 6.5 Finance
  - 6.6 Smart Economy
  - 6.7 Circular economy
  - 6.8 Prosumers and Social Model
- 7. History/Background**

CSDD
- 8. Definitions**

SDGs
- 9. Sources**

## Part I

### 1. Executive Summary

*(An executive summary will be elaborated in the upcoming weeks. Regarding the deadline for reply submitted in the letter by the Minister of the Economy, the present opinion is sent without this summary).*

### 2. General remarks

This report requested by the Minister of Economic Affairs aims to provide an opinion and a collection of the CSDD's reactions and suggestions to the 'The 3<sup>rd</sup> Industrial Revolution' (TIRLux) strategic study and model.

The CSDD has been asked to give constructive challenges on where the proposed strategy requires areas of improvement – including moving towards a more holistic vision.

The CSDD would like to begin by congratulating the Ministry of the Economy, the Chamber of Commerce and IMS Luxembourg for the initiative of this strategic study as well as for the collaborative and bottom-up way in which it was carried out. The CSDD welcomes the variety of subjects tackled with the six sectorial topics (energy, mobility, buildings, food, industry, and finance) and the three horizontal axes for the more transverse areas (smart economy, circular economy, prosumers and social model).

It was the first time that Luxembourg undertook such a strategic study with experts of various backgrounds sitting and discussing together freely. The tough schedule set beforehand with (only) four meetings per Working Group (WG) provided remarkable output, guided by the support and professionalism of Jeremy Rifkin and the IMS team.

The participatory process, the extended vision with the given timeline 2050, and the specific objectives of 100% decarbonisation and 100% organic farming are greatly appreciated by the members of the CSDD. We nonetheless acknowledge that these goals will represent a considerable challenge for Luxembourg.

The CSDD will try to strengthen the initial TIRLux proposal by addressing eventual shortcomings with possible solutions (or new perspectives to explore) and call attention to systemic discrepancies that may inhibit the TIRLux to reach its potential.

As a short introduction to the points that will be addressed in the following report, our fundamental challenge lies in the purely economic drivers and explanations given in the TIR. **Economy is a medium, not a purpose in itself.** We believe a wider vision on **human ecology** and **social change** is missing, and should be the key success factor of the changes being adopted. It is human interactions need to change fundamentally, and this depends on how we understand, relate to and value the environment. It is not just a matter of technological change for an efficient economy, but also what values and beliefs about the world we express in technological design and innovation, as technologies then to a large extent shape our actions and social practices in our every-day-lives. And while the study sets processes and systems building towards a 'new future', we need to formulate a more concrete vision of Luxembourg in the year 2050 to guide our way forward.

The CSDD would like to highlight also the **‘Resilient Communities’ Model’** because it has the potential to unfold adaptive solutions for the future. Beyond offering ‘business models for retaining locally created value’, cooperative models are likely to be more needs-based and therefore develop resilience models available for peer communities around the globe. While the TIRLux report addresses several ‘hardware’ issues that are helpful to embrace change and future challenges (such as circular economy), the CSDD strongly recommends placing more emphasis on the **people** aspect of change, in which ‘Resilient communities’ are a good starting point. **CSDD recommends launching a new working group under the TIRLux to fill this gap.** This might be a good opportunity to link the TIRLux explicitly to the experience on the ground around the "Pacte climat" and engage local authorities in the process.

The following elements are a summary of our proposed additions to the TIRLux:

- Overcoming Luxembourg’s “Financial Dilemma”
- Resizing Luxembourg’s disproportionate Footprint and taking into account the available bio-capacity per world citizen of 1.3 gha/capita in 2050, i.e. the ‘*One Planet Luxembourg*’ (see: [www.myfootprint.lu](http://www.myfootprint.lu))
- Making future development more inclusive and overcoming the risk of a societal fracture (by addressing shortcomings i.e. in the healthcare sector, cultural integration, poverty alleviation, social justice, etc.)
- Defining a clear governance structure and setting ambitious yet practical next steps for future process and implementation for the “TIRLux strategy”
- TIRLux must be analysed, evaluated and adapted according to the 17 Sustainable Development Goals (SDGs) of the UN-Agenda 2030

### 3. Key Challenges and Considerations

In this section, we will address five key challenges that we believe the TIRLux should consider.

#### 3.1 Luxembourg’s Financial Dilemma

The Ministry of Economic Affairs strives to transform our national economy by maximizing the potential of the *Internet of Things* and *Big Data* to overcome and strengthen the weakening financial situation and to compete in the global economy. This has included significant investments in the infrastructure to support the digital economy to promote the automation and digitalisation of services and industrial processes. These investments are meant to support the diversification of the Luxembourg economy and strengthen both the existing and future sectors – including financial services, energy, transportation, communication and even space development.

Despite the permanent growth of our economy over the last decades, Luxembourg’s total financial dept is increasing. Furthermore, the investments needed to adapt our infrastructure (housings, buildings, hospitals, schools, mobility, safe food, fresh water, sewage plants, air pollution...) to cope with the ongoing growth of manpower and population (the 1.1 million State by 2050), further stresses our financial situation and is not being properly considered. In

addition, our aging society challenges both our health and pension system and have yet to be addressed with suitable solutions.

*In conclusion, the desire for economic growth with exaggerated growth rates is in opposition to the limitations and availability of resources. This is not just a problem for Luxembourg, but a global one.*

### 3.2 Luxembourg's Disproportionate Footprint

The Ecological Footprint measures human consumption of products and services from different ecosystems in terms of the amount of bio-productive land and sea area needed to supply these products and services. In other words, the Ecological Footprint calculates the land area needed to feed, provide resources, produce energy, and absorb the pollution (CO<sub>2</sub> emissions) generated by our supply chains. As this land is distributed around the world (i.e. products and services in Luxembourg are imported from all around the world), the figure is expressed in **global hectares** (gha), i.e., hectares of land normalized to the world's average productivity. Currently, the Ecological Footprint and bio-capacity calculations cover six land use types: cropland, grazing land, fishing grounds, forest land, built-up land and carbon uptake land.

The area of land or sea available to serve any given use is called **bio-capacity**, and represents the biosphere's ability to meet human demand for material consumption and waste disposal. In other words, the bio-capacity represents the capacity of an area or ecosystem to generate an ongoing supply of resources and to absorb its waste (CO<sub>2</sub> emissions). Un-sustainability occurs if the ecological footprint, i.e. the demand on the system, exceeds its bio-capacity. According to the 2016 edition of the National Footprint Accounts developed by the Global Footprint Network, and validated by the CRTE of CRP Henri Tudor (today LIST), humanity demands the resources and services of 1.6 planets back in 2015. This situation, in which total demand for goods and services exceeds the available supply, is known as overshoot.<sup>1</sup> On the global scale, overshoot indicates that stocks of ecological capital are depleting or that waste (CO<sub>2</sub> emissions) is accumulating.

The **Ecological Footprint** can be used as a tool to evaluate the impact of national, regional or local consumption patterns on the rest of the world. The communication of resource depletion using a global area (in gha) is effective and commonly accepted. Global hectares can be understood as a currency. Indeed, in comparison to money, global hectares express a physical unit: Physical national hectares are translated into theoretical global hectares. The Ecological Footprint highlights the responsibility of countries and their citizens by showing how much land is consumed worldwide due to their way of life. This raises the awareness of global resource depletion and the individual responsibility for global problems. The policy application of the Ecological Footprint as an indicator for sustainable development is discussed as part of a basket of sustainability indicators by the Directorate-General for the Environment of the European Commission.<sup>2</sup>

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<sup>1</sup> The "world overshoot" is the tipping point when humanity exceeds its natural annual nature capital - and is usually in August. For Luxembourg, however, it occurs around mid March.

<sup>2</sup> Nevertheless, it does not allow for an assessment of environmental impacts as comprehensively and as detailed as e.g. life cycle assessments do. Different studies on the Ecological Footprint discuss the incompleteness of the method concerning the assessment of environmental impacts related to the consumption of a country. Sector based bottom-up inventories of product categories based on Life Cycle Assessments (LCA) could be combined with the Ecological Footprint. Life Cycle Assessment takes into account comprehensive environmental impacts (greenhouse effect, eutrophication, acidification, eco-toxicity, etc.) of e.g. a product over its entire life cycle, from its production to its disposal (from cradle to grave). In this perspective, economic input and output tables are extended and linked to environmental impacts.

Based on the 2008 National Footprint Accounts for Luxembourg a total Consumption Footprint of 5,549,008 global hectares and a per capita value of 11.83 gha has been calculated. ***In sum, Luxembourg would require 6 planets to sustain our current living, i.e. consumption patterns.<sup>3</sup> We are clearly living way beyond our means and environmental capacity. This must be taken into account by the TIRLux and all working groups especially in the light of the 1.1 million inhabitants foreseen by the year 2050.***

### 3.3 Beyond Footprint: the Climate Divide

Luxembourg's climate policy is framed by its international climate obligations. Luxembourg contracted to the UN Framework Convention on Climate Change in general and the principle of 'common, but differentiated responsibility' which puts an emphasis on the global justice dimension of the climate issue (in terms of impacts on the most vulnerable and in terms of efforts sharing between members of the Convention). It will be highly challenging - maybe even inconceivable - for Luxembourg's policy makers to combine Luxembourg's commitment to a 4% economic growth rate with an attempt to put in place an ambitious national climate strategy.

As we know, the effects of climate change are already a daily reality for many people, particularly for the world's poorest and most vulnerable. Since carbon-based growth is no longer a viable option neither in the North nor in the South, we point at the urgent problem to address decarbonisation in a twice-divided world. This is sharply polarized between the nations of the North and the nations of the South, and then again between the rich and the poor people within those nations. In 2014 the per capita emissions of Luxembourg was 19 tonnes, which is 7 times the global per capita emission, assuming that every human would have the same right in a climate constrained world (see: [WGBU](#)).

However bad Luxembourg's historical climate record may be, it is important to acknowledge that the government has recently made substantial efforts to take its responsibility in light of the Paris Accord. The national counterpart of its international commitments will be the third Action plan on climate change that is about to be drafted before the end of 2017. ***CSDD would like to put emphasis on the need for a truly participatory and transparent approach for this process.***

### 3.4 Social Justice

As a final and critical comment, we return to the fundamental issue: people. The human element is at the core of both the problems we are facing AND the solutions. It can therefore not be undervalued to recognize the impact on the people living in the country.

The people issue is mapped to the SDGs - from addressing inequality (SDG 10), Gender balance (SDG 5), Communities (SDG 11), to decent work (SDG 8), which should be emphasized in all the follow-up working groups.

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3 The shares of Luxembourg's inhabitants and the commuter's consumption concerning the final consumption of food, non food products and housing is assessed with expenditure statistics. The road fuel consumption distribution is based on an emission calculation model. Effectively, Luxembourg's total Consumption Footprint can be attributed by 62% to the inhabitants, (7.33 gha), by 16% to the commuters and by 22% to fuel tourism and transit. The Inhabitant's footprint is dominated by 61% of non-food products and services; food, mobility and housing are responsible respectively by 18%, 12% and 9%. The commuter's footprint is dominated by non-food products and services too with a contribution of 52%; food and mobility are contributing respectively with 16% and 32%.

With the TIRLux pressure, more and more organisations and businesses will get involved or even constrained in the handling of *Big data*<sup>4</sup> - storing, processing, and extracting value from data of all forms and sizes. Systems and business models that support large volumes of both structured and unstructured data will continue to rise. The market will demand platforms that help data custodians govern and secure big data while empowering end users to analyze the information. These systems will mature to operate well inside of enterprise IT systems and standards.

The consequent implementation of these systems within the heart of our life and the daily practice of each individual risks to set us off track from our journey towards the claimed sustainability and the old, the poor, the disabled, i.e. all those persons that are not or even less capable or not at all equipped with the newer digital devices and services. Furthermore, the estimated higher efficiency and asserted superior profitability of the actual businesses will force automation in all sectors of the economy. Finance, services, and daily life will require considerably less employees and workers. Unemployment will rise as a very first and hard consequence.

*The newly unemployed together with the ITC disabled will become socially set aside. To avoid any further discrepancies in our society a very subsequent program of education, formation, and reorientation must be implemented in parallel of the TIRLux to sustain these people with the objective of reinsertion in our community.*

### 3.5 Intergenerational / Loss of Human Capital

The TIRLux must be a plan that works for ALL citizens who live and/or work in Luxembourg. The strategic study needs to address the societal risks that TIRLux carries. Although they may not be new, those risks could be reinforced if the threats towards societal fractures are not addressed at different levels, including:

**Intergenerational:** new technologies and modern life styles have always been a challenge for the elderly, but the acceleration of automation processes, the development of tech-based prosumers models, and the integration of artificial intelligence in our daily lives (for transportation, elder care etc.) will be difficult for older generations to follow. A simple example is the difficulty that elderly have in filling in their electronic tax returns (*déclaration d'impôts*) or doing their bank payments online.

**Intercultural** and in terms of **language barriers:** Luxembourg is among the most international places in the world. The rate of foreign nationals in the active population is 71% - 45% cross-border employees and 26% resident foreigners.<sup>5</sup> The development of Luxembourg as a global “polis” may become a serious issue in terms of communication, identification and trust between people and cultures.

**Social Interaction:** robots are already used today not only to fulfil high performance technical skills (like in laboratories, mine clearance etc.), but also for elderly care, training of people with disabilities and education of youth. If care is among the few social interactions

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<sup>4</sup> Also to be considered – the data privacy issues that are a concern globally

<sup>5</sup> Source: <http://www.luxembourg.public.lu/en/le-grand-duche-se-presente/luxembourg-tour-horizon/population-et-multiculturalite/>

people can have in some situations, the robotisation of care can lead to exacerbation of solitude and diminishing human bonds. This element needs to be taken into account.

**Income Divide** (>15% at poverty risk in Luxembourg) and **Social Exclusion**: In Luxembourg, one in five citizens (19 percent), according to Europe-wide calculations lives in or on the border of poverty and therefore threatened by social exclusion. According to STATEC, 26% of Luxembourg's inhabitants have lived through a poverty experience period 2012 – 2015<sup>6</sup>.

Highly qualified people will find work in the context of TIRLux, while low qualified jobs will be replaced by automation in quite a few sectors (see below). This not only creates tensions in the job market, but encourages a general societal trend that can create a knowledge/education divide between those who are unable to follow because they lack sufficient skills.

**Access to Decent Work** and preserving a **Safe Working Environment**: Workers are at high risk if there are no social safeguards incorporated into the TIRLux initiatives. As indicated, low-skill, routine jobs are at risk of being eliminated because of automation of certain tasks (mainly in industry but also some in the services sector). The “zero marginal cost” myth may create the illusion that work can be done at almost no cost and that jobs must be cut to be competitive. There is also high risk of (self)exploitation and social dumping in terms of working conditions and income due to the extreme flexibility expected from independent workers that operate from home or in co-working spaces but have no clear working contract. There is a strong trend to deregulate working times, creating pressure on workers to be accessible/reachable at any time, which can deteriorate their private / family space and even health conditions due to stress. *Tele-work and other remote models should be regulated by legislation as safeguards to protect workers from exploitation.*

**Impact on the Social System**: It is unclear whether shared economy and prosumer models will lower the state income through tax or social security contributions. If people can work from wherever they like (thanks to an extremely performing “*Internet of all things*” system), which country's tax system should be applied?

**Adaptation**: Small and medium-sized enterprises (SMEs) (< 250 employees), employing 68% of Luxembourg's workforce, are the most common company size in Luxembourg. They may be vulnerable to extremely fast and significant changes in terms of technology, governance and working models as they cannot leverage resources that big companies have access to for reorganization, restructuring, training etc.

**Democratic Systems**: There remains ambiguity whether the rise of social media has a positive or negative impact on democratic processes, such as elections. There are serious concerns and trends to manipulate people's opinions based on accessible data on preferences and behaviours. Again, TIRLux is not going to be the root of such existing problems, but it can bring up new challenges in this domain.

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<sup>6</sup> Cahier économique N° 121 Rapport travail et cohésion sociale 2016

## 4. Future Process and Implementation

Until now the content of the TIRLux strategic study is a vision with the aim to implementing part or all the measures raised. Many of the given opportunities and measures are not yet anchored in a very practical way for immediate use. The different working groups must set realistic figures, fool guards, timelines and milestones from the initialisation to the full implementation of the TIR measures. To achieve this aim education and good governance are needed. As a general remark Life Cycle Assessments should be generalised for all sectors and for all products and services in order to make production processes and thereof decisions transparent.

### 4.1 Education

The Third Industrial revolution calls for a revolution in the ‘classroom’ with implications for new curricula, new organization, new teaching and new student assessment.

Education is accepted as a key factor in changing and transforming human behaviour and practices towards a healthy and sustainable life. In the world of globalization and the new economics of today, life in a highly competitive environment requires students to seek knowledge beyond the classrooms and books. They are expected to have communication skills, problem solving skills and leadership abilities. As an agent of change, education should be designed to incorporate a holistic domain of knowledge adapted to the changing world, which includes skills as well as values.

The Conseil Supérieur pour un Développement Durable explored requisites for better coping with accelerating technological and societal change in-line with what is called for by policies on the third industrial revolution in a participatory scenario process from 2013-2016. This future- and systems-oriented process, which engaged experts and opinion leaders on education in Luxembourg from diverse sectors yielded the following main three recommendations:

1. Anticipating and steering of accelerating technological change: Development of a versatile school system that equips students to cope with accelerating and interdependent changes in technology, society, economy and environment, with a new focus on system thinking to complement the current curriculum in which connections across diverse disciplines are rarely made.
2. Countering increasing risks of societal fragmentation: The Luxembourg school system must change to convey a more wholistic education that counters societal fragmentation in an increasingly diverse population, actively engaged and responsible citizens, and equitable chances for each student. A system is required that is student-centred, designed to nurture empowerment and self-direction required for entrepreneurial activities, as well as a love for learning and self-esteem.
3. Educating reflective and capable practitioners and entrepreneurs: More project and problem-oriented experiential learning opportunities embedded in practice with employers in the private and public sectors and entrepreneurs, to ensure schools equip students with knowledge and capabilities required in the job market.

The education system must therefore develop close ties with the innovation-driven economy. This is of mutual benefit as students become familiar with the latest technologies and the private sector has the chance to select talents and recruit its workforce. Companies could send



employees as ‘teachers from the real world’ so that students experience realities through their own experience.

The state must invest heavily in restructuring Luxembourg’s education to educate and equip students with required skills and expertise to serve the national job market and to decrease the number of externally recruited experts.

The multi-lingual Luxembourgish education system with three different languages of instruction must be adapted to the pupils and the demands of the market. For example, better proficiency in English could prepare students to apply for jobs on the international labour-market. For those children with a specific talent in languages, instruction in additional languages such as Spanish and Chinese could be offered.

Science, technology, engineering and mathematics (STEM) related skills will not only be a great advantage to finding a job. STEM workers will also drive the ongoing technological revolution by generating new ideas, new companies and new industries.

Logic and handling of technological devices must be integrated into early stages of education as well as training in abstract and systematic thinking, self-esteem, persistence, discipline, absorbance of new information and the ability to work individually or in a team. The STEM curriculum will not only impart scientific and technical knowledge but it will also emphasize critical observation skills and systematic aggregation to come to individual knowledge-based conclusions and solutions alone or in teams; to develop own concepts and models to come to new knowledge and to learn from mistakes. Students should learn to communicate thoughts and opinions in a precise, qualitative and quantitative way, exercising both scientific content and language skills. The STEM curriculum plays an essential role in educating children to become critical, responsible, and informed mature citizens. It must start at the age of 5 and continue throughout high school to comply with the countries’ needs in these areas.

Personal development is facilitated by ‘learning by doing’ and can be adapted to the person according to their personality, development, personal interests, and walk of life. In our increasingly heterogeneous society the educational system must be aware of the influx of children with strong socio-economic and/or language handicaps paired with mixed attitudes towards education

Another big challenge of the schools of tomorrow is to enable students to learn how to select and translate global knowledge from the web into knowledge that makes sense and is tailored for locally specific circumstances. This includes intellectual as well as manual skills for jobs installing and maintaining all kinds of machinery automated or not.

New approaches to social learning for sustainable transformation to solve complex problems at the interface of social norms and practice and energy and resources use now draw on citizen engagement, practitioners and weave in science on tap rather than on top. Conveying knowledge, competences and behaviours to engage in sustainability science for social learning is perhaps the most important goal of schools.

Developing empathic competence, the ability to recognize emotions in others and understand their perspective as the basis of mutual respect, understanding and tolerance is as important as the scientific approach. It is fostered through multilingualism, constant dialogue and

active participation. It gives high regard to respect, mutual understanding and tolerance. Empathic competence could be directly addressed through the STEM curriculum, artistic expression, literature, history and critical thinking of current events. It involves the social sciences, arts and music, besides the social interactions of the classroom.

Education in values is more important than ever. Altruism and social and environmental awareness should remain highly credited values even if self-fulfilment and academic excellence as well as technological innovation will play a major role. Incorporation of these values can guarantee professional success and as full-time working parents do not have time to do so, the teachers are in the responsible position to convey values.

If we expect the Third Industrial Revolution to align with the United Nation SDGs, environmental sustainability education should be a lifelong process beginning in kindergarten and not restricted. It should encourage a holistic view of sustainable development, where economic, environmental and social factors are treated as aligned entities. The coming generations must learn that all life has intrinsic value and experience a reverence towards all life to experience the beauty, the integrity, the exuberance, the generosity and the economy which holds the entire web of life together. In place of controlling, owning or possessing, they must learn to participate in the process of the intricately woven web of life.

***Luxembourg should become a laboratory for sustainable living while pushing and enhancing the educational system towards awareness of our biological world and the necessity to safeguard all its fundamental functions.***

## 4.2 Good Governance

Creating a model for best practice in creating a constructive, collaborative, diverse, participatory process is the prerequisite to move Luxembourg towards a common vision of sustainable development that benefits as many as possible, while maintaining a stable and functioning socio-economic development.

The research on strategies for sustainable development has shown that both efficiency and sufficiency strategies have a role to play. By means of dematerialization (efficiency), environmental compatibility (consistency) and self-limitation (sufficiency), including a comprehensive perspective on economic processes, a new form of prosperity and individual well-being must be fostered.

***The question of sufficiency, i.e. with what material outlay we wish to achieve happiness and satisfaction, has certainly been suppressed for too long, and must be addressed in all the TIRLux working groups.***

## 4.3 Food

“*Make 100% of Luxembourg Agriculture organic*” is a welcomed vision the TIRLux addresses. By 2050 no synthesised chemicals (pesticides, fertilizers, antibiotics, growth hormones ...) should be applied in any farming processes. ‘*Farming in nature’s image*’ is the credo. Once realised, and even on its way there, Luxembourg should function as a laboratory by implementing a strong partnership between the government, the food sector and the research institutes to build up a ‘*safe, high quality, transparent and sustainable food sector*’. As our agricultural land is a less favoured area, Luxembourg’s agriculture will be settled in a niche as some of our other economic sectors are outlined. The proposed practices in the strategic study as permaculture, consumer supported agriculture (CSA), urban gardening and cooperative working are welcomed.

But the TIRLux ‘FOOD’ does not at all address the agricultural land and energy needs for the food required to feed our growing population. Nor the food consumption patterns that allow food safety and sustainability. According to TIRLux, for some extend agricultural land should be utilised for renewable energy plants – 10% out of 20,000 ha for wind turbines, 14,000 ha for photovoltaic panels – to make Luxembourg’s renewable electricity needs 100% self-sufficient. Furthermore, the potential in ‘climate action’ and ‘water cycle’ agriculture can excel in by specific, newly discovered and developed farming methods as yearlong greening, reduced or no till, direct seeding/sowing, longer rotations, diversified cultures, holistic grass management ... in order to sequester carbon, to foster Evapotranspiration and to protect water is left out in the strategic study. This new approach to farming goes beyond the so called organic farming. Enhancing the complex life of microorganisms in our soils by all natural means will save our planet. Food production must become a by-product of living soils, where water is held back, biologically and physically filtered, airborne CO<sub>2</sub> and N<sub>2</sub> are bound into the plants, their leaves and roots, and into the soil, and Evapotranspiration – the natural and highly efficient air-conditioning system on our finite planet – can work at its best to help breaking the climate change.

Therefore a clear and consistent strategy must be set up in the WG following the TIRLux process, now called “*Intensification durable de l’agriculture*”. The necessary ongoing monitoring systems for this transition exist and are applied in routine in Luxembourg trough

both the research institute IBLA a.s.b.l. in Munsbach/L (Sustainability Monitoring and Assessment RouTine, SMART), and the farmers' cooperative CONVIS in Ettelbruck/L (Farm Gate Balance, FGB).

A more difficult part will be inherent in the Common Agricultural Policy (CAP). How can Luxembourg implement special taxation on eco-toxic chemicals used in agriculture, or forbid some soil destroying practices on the scale of our country without hurting existing EU-laws? But the most difficult part by far will be how to convince those 96% of non-organic farmers in Luxembourg today to change their inherited, highly destroying production methods. Taxes and subsidies alone will not be sufficient. To begin with, "*Luxembourg Goes Organic*" must be straightened out in our nation branding. In addition the collateral deed of the conventional farming methods must be assessed and taxed according to the polluter pays principle.

If done so, Luxembourg's agriculture may contribute to the necessary transition towards a big part of the SDGs. On the other hand, the food consumption pattern must be adapted to fit within the world's bio-capacity.

#### **4.4 The Healthcare Sector**

The members of the CSDD do not understand why the Healthcare sector was not included as its own section in the strategic study. It is a core part of society and of our economy – for which there is a dedicated SDG.

We expect considerable change and disruption in the healthcare sector, due to demographic changes, the impact of technology, climate, personalized medicine, regulatory changes etc.<sup>7</sup>

Luxembourg has already invested heavily in innovation in this sector, with multiple projects across biotech and related domains. For example, the "Luxembourg Centre for systems Biomedicine" (LCSB) of the University is part of a major government initiative to develop Luxembourg into a competence centre of molecular medicine and research in the area of personalized medicine.

A patient-centred concept tailored for specific individual needs is based on *Big Data* including phenotypic traits as age, sex, weight, height, education, activity, sports, diet, illness symptoms, blood test results, medical treatments and their results. A highly efficient and powerful ITC sector for computing individual phenotypes with the underlying personal DNA sequences adds to this development. Big Data and ITC are both considered as trump cards in the TIRLux strategic study. Furthermore, one of the most advanced pieces of equipment for automated DNA sequencing has been acquired and is working in Luxembourg.

The Minister of Health stressed in 2015: "*Personalised Medicine is all about the patient and innovation. Personalised Medicine starts with the patient. It features big potential for improving the health of many patients and ensuring better outcomes of health systems' efficiency and transparency*". Moreover, in times of budgetary constraints, facilitating better-targeted and more cost-efficient treatment – to a potential 500 million patients in 28 EU

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<sup>7</sup> The recently established "*Integrated Biobank of Luxembourg*" is also part of this important project. The LCSB is the second "Interdisciplinary Centre" of the University. Already at the beginning of 2009 the "Interdisciplinary Centre of Security, Reliability and Trust" was founded. The LCSB cooperates very closely with an elite American partner institute, the "Institute for Systems Biology" in Seattle, USA

Member States – is in line with the Europe 2020 strategy and the aims of the EU-Commission.

The challenge to be addressed is to put into place a framework that facilitates delivering the right treatment to the right patient at the right moment, in accordance with the principle of universal access to high quality healthcare. Yet, its integration into clinical practice and daily care is proving difficult given the many barriers and challenges to timely access to targeted healthcare that still exist as of today. Therefore, another specific working group should tackle these difficulties by searching for simple but efficient solutions while computing, analysing and assessing utmost personal data for a highly proficient healthcare servicing us all.

***For all these reasons – and more – this sector should clearly have been included in the TIRLux on its own merits and deserves a working group in itself.***

## **5. Conclusion and Open Questions**

TIRLUX as a strategic study develops cost-effective, highly innovative and money-making approaches in different economic sectors. *Internet of Things* and *Big Data* interlinked and managed by a modern ITC-infrastructure is the key to all development. Despite the transversal areas considered in the study, TIRLux does not fully address a more holistic move towards a sustainable society that in the long run adapts to our share of the natural boundaries of the finite planet.

Simply put, Luxembourg must work on a long term '*One Planet Luxembourg*' strategy as mentioned above. The National consumption patterns of the inhabitants and the commuters in Luxembourg must be detailed with respect to housing, mobility and the consumption of food, goods and services within the WGs. Additionally, the key sectors such as industry, construction and services must be further analyzed. Based on these analyses, short term recommendations on how to reduce Luxembourg's environmental impact (and thus its Footprint) could be given. Public awareness of global issues as resource depletion due to national consumption and behaviour should be raised.

***Political vision and ambition is required. The Government of Luxembourg should step up and scale up the transformation to a 'One Planet Luxembourg' alongside the implementation of TIR - and in parallel with the SDGs raised by the UN-Agenda 2030.***

In summary, given the outlined challenges, the TIRLux process should aim to give answers and solutions to the following questions:

- Does the TIRLux help Luxembourg and its growing population (of 576.000 people) to adapt living standards within its small share of the boundaries of the one finite planet?
- The CSDD's study on Luxembourg's Ecological Footprint in 2008 showed that if every world citizen would live like Luxembourgers, the world would need at least four (if not six!) planets to uphold the bio-capacity of 8 – 12 gha/capita to absorb the enormous quantities of CO<sub>2</sub> (19 t/capita/a) given off by our significant consumption of food, energy, and goods.

- Does the paradigm shift towards a sustainable ‘smart’ Luxembourg enhance Luxembourg in achieving the SDGs of the UN Agenda 2030?
- Does the implementation of TIRLux’s study bring Luxembourg consistently forward in its attempt to develop sustainably?
- Does TIRLux solve Luxembourg’s intense desire for a permanent high economic growth to buffer its financial situation based on a poorly diversified industry?
- Will the planned paradigm shift really profit the entire society? Does the TIRLux enhance the well-being of all humans directly or indirectly within Luxembourg and those lands, systems and people we depend upon?
- Will unemployment, poverty, social exclusion, and societal cleavages be significantly lowered? Will solidarity and cohesion continue develop within our society?
- Does TIRLux provide in a consistent manner safe and affordable food, fresh water, and a sound, highly bio-diverse environment for all?
- Does our whole health care system profit from this paradigm shift? Are there intentions to add a specific focus on healthcare as a critical element of the TIRLux vision?
- Does TIRLux minimize or even cancel our negative influences and collateral damages on the developing world and on the environment?
- Is our actual education system adapted to the aims of TIR and the challenges of country willing to develop in a sustainable way?

### **Some final thoughts...**

*The premise of the TIRLux is to be ‘the first’ to establish – and profit from – the adoption of sustainable practices. It realistically carries considerable risks, costs, but also opportunities. We should not underestimate the challenges of the so-called first-mover “advantage”. It will be a difficult and resource-intense experiment that will have unexpected consequences, ripple effects as well as overall threats.*

*We need to be prepared to PIVOT quickly and effectively to navigate through the surprises and changes.... And accept that there will be errors on the way. This in no way suggests that we should not embark on this exciting journey.... It only means we should be prepared for anything (the good, the bad, and the ugly).*

*The TIRLux working groups must consider the possible and probable consequences created by the initiatives on each citizen’s needs and equal share of an affordable access to fresh water, safe food, uncontaminated air, decent housings, and enjoyable jobs.*

*Furthermore it is clear that the TIRLux needs to open its scope to the Greater Region.*

*Human-environment interactions need to change fundamentally, and this depends on how we understand, relate to and value the environment. It is not just a matter of technological change for an efficient economy, but also what values and beliefs about the world we express in technological design and innovation, as technologies then to a large extent shape our actions and social practices in our every-day lives.*

## **Part II**

*Part II of the CSDD opinion on the “Third industrial revolution” presents additional but not exhaustive perspectives and comments on most of sectors of TIRLux. They are meant to be considered as input by the CSDD to the working groups on the implementation of TIR.*

### **6. Sector Breakdown**

#### **TIRLux background**

The TIR strategy was proposed as an economic model that can be transposed in praxis in Luxembourg (as an open-minded country) to create profitable niches while simultaneously reducing the impact on the nature and our environment. It is primarily based on the *Internet of Things* and *Big Data* while building upon a growing ICT sector.

[www.troisiemerevolutionindustrielle.lu](http://www.troisiemerevolutionindustrielle.lu)

**The Rifkin TIR is broken down in six sectorial topics:**

Energy, Mobility, Buildings, Food, Industry, Finance

**... and three transversal axes:**

Smart Economy, Circular Economy, Prosumers and Social Model

#### **6.1. Energy**

The government needs to set up a clear, multi-year strategy for the targeted exit not only from fuel tourism, but generally from any fossil fuels. This is not just about replacing fossil fuels with renewable energies. New techniques with innovative solutions are needed. The combustion engines in cars, trucks, locomotives, ships, and airplanes are pretty much the greatest destroyers of fossil energy of the last 120 years. On average, only about 18% of the energy contained in petrol and diesel fuels is used as a net force or as means of transport. The rest is emitted either indirectly via the cooling water or directly to the atmosphere.

Renewable energies in and with old techniques cannot be the solution. Fuels in conventional heating systems also waste much of their energy. The energy efficiency could be improved immediately by means of small, heat-operated cogeneration plants (combined heat and power (micro-)plants, CHP), where heating and electricity are generated and used in parallel. Therefore smart grids are a prerequisite.

As regards the use of biomass, the CSDD points out its opinion from 2008. Only a sound life cycle assessment (LCA) can evaluate the exact 'green' share of its energy content. E.g. biogas plants are by no means as green as generally assumed. If farmers drive manure, maize, and other plants with a maximum of 35% dry matter content over long distances with low-priced fossil diesel into the fermenters, and the fermentation residues with an even lower percentage of dry matter (less than 25%) back onto the fields, much energy is left on the road. Moreover, ploughing, seed production and its coating, sowing, fertilization, plant protection and harvesting make the maize cultivation losing at least 40% of its total energy content right in the field. The biogas obtained, mainly from the fermentation of maize, contains less than half as real 'green' energy.

This is not a step forward. But the state supports up to 100% the so produced and fed-in electricity, even without any use of the renewable heat as by-product. In Sweden, only residual materials and waste, which cannot be recycled otherwise, are allowed to enter biogas plants. The extraction of the carbon dioxide in the crude biogas to feed-in pure methane ( $\text{CH}_4$ ) as so-called bio-methane into the existing natural gas grids is also very energy-intensive. The necessary admixture of up to 9% of fossil liquid petroleum gas (LPG), which is exclusively transported and delivered by road, once again significantly reduces the 'green' share and the net energy gain in the feed-in bio-methane.

Furthermore, the biogas slurry contains much less carbon than the imported products as plants, slurry or manure. During the fermentation, the biomass is partly converted to approximately equal proportions into methane ( $\text{CH}_4$ ) and carbon dioxide ( $\text{CO}_2$ ). The carbon (C) thus extracted via both gas molecules dilutes the biogas sludge. Its use as organic fertilizer carries similar risks to that of artificial fertilizers (nitrate and phosphorus leaching, soil compaction, erosion...). So carbon (C) is systematically removed from the cycle of photosynthesis. The maize is an extremely humus-devouring plant which removes high amounts of nutrients and organic matter from the soil.

In the future, the selling prices for all fuels – including renewable fuels – must reflect the energy produced during its whole production process, the usable final energy content, and the share of the renewable part in it. Taxes and VAT must be graded equally for all energies and for all applications. Life cycle assessment (LCA) for their production and for their use is to be demanded in the future by all manufacturers, suppliers and users. Without this transparency, no purposeful progress will be made in the generation, use and saving of energy.

In addition, all known collateral damages must be internalized in the price calculation and presentation: in view of current knowledge diesel fuel is decidedly too cheap in comparison to gasoline. The energy content of the diesel is almost 10% higher than that of petrol. Its combustion occurs at much higher compression, whereby the nitrogen ( $\text{N}_2$ ) contained in the air is oxidized. Therefore, the higher nitrogen oxide output ( $\text{NO}_x$ ) per litre consumption is also directly related to the gasoline engine. Diesel also consists of longer hydrocarbon molecules and has a higher specific gravity than gasoline. The combustion of one litre of diesel produces about 10% more  $\text{CO}_2$  and significantly more soot particles than one litre of gasoline. Due to the near-term cultivation, the  $\text{CO}_2$  balance is only slightly better for biodiesel than for its fossil counterpart. Its combustion in diesel engines also entails the same environmental disadvantages and health risks as the fossil diesel. If the biodiesel from rape or corn, i.e. via field plants using artificial fertilizers and chemical plant protection is burned in



diesel engines with an average efficiency of about 20%, this supposed, renewable approach makes no sense at all. On the contrary, it is a state-aided waste of arable land, money and resources.

Similar considerations, calculations and life cycle analyzes must be carried out for all fuels offered, whether gaseous, liquid or solid, including electricity, and those from nuclear reactors. This must be an integral part of the future strategy in the case of a comprehensive conversion to renewable fuels. Only in this way can the abandonment of fossil fuels to the truly renewable ones be clearly and convincingly argued and conveyed plausibly.

Special attention should also be devoted to electricity storage. E-mobility is (almost) unambiguously portrayed as forward-looking and seen as the solution to the decarbonization of many of our individual mobility requirements. E-motors and all common battery types and accumulators need many rare elements, which are obtained under very questionable conditions of human health and questionable social environments. In this respect, transparency and re-use must also be established by means of life-cycle analyzes. It is not enough that manufacturers declare to take back their batteries with the assertion of using them differently. This approach and this statement are not given at the moment. Furthermore the amount of rare elements at our disposal is by far not enough for the mobility claims of 7 billion people. A good example here is perhaps the comparison to the unsolved cluttering of nuclear waste. E-mobility is, in turn, a high-tech solution with very high development and manufacturing costs and, unresolved consequential costs and losses. In the introduction of this technology we apply a similar behaviour and bird-ostrich policy, as in the case of the first nuclear reactors.

***Luxembourg should, within the framework of its recent support to the circular economy and those of its research institutes, aim to calculate the internalization of production routes, energy efficiency and all possible collateral damage to the environment and health in pricing for all possible fuels, techniques and applications.***

The CSDD would not only welcome this approach but also support it morally and support it under the motto "*Sustainability by transparency, trust, citizen engagement and prosumers*".

In this context the CSDD stresses its opinion on the 2<sup>nd</sup> National Climate Action Plan adopted in its plenary session on April 7<sup>th</sup>, 2017.

## **6.2 Mobility**

### **Holistic and systemic thinking and action in urban planning**

Mobility (as an integrated system) is not yet (or not enough) woven into the spatial, social, economic, political and environmental fabric of cities and of Luxembourg's urban planning as a whole. In charting a path for sustainable (urban) mobility, it is essential to apply an ecological and systems framework that recognizes this. Only by recognizing the systemic nature of problems (mispricing leads to overconsumption of roads in peak periods; sprawling settlement patterns render public transport systems ineffectual; urban design for machines rather than people creates cities for cars rather than people) can significant headway be made in charting a sustainable mobility future.

### **Transport as a means, not an end**

It is essential that travel is recognized as a ‘derived demand’ – i.e. derived from the need for people to socially and economically ‘interact’. The end or objective of most travel is to meet a friend, earn income, attend school or purchase a good, not movement per se. Cars, trains, buses and bikes are simply the means to achieve these ends. Making this distinction shifts the focus to ‘people’ and ‘places’ and away from ‘movement’. This realization envisages cities, neighbourhoods, regions and mobility systems as tools that promote desired societal outcomes – such as live ability and affordable access – with transport playing a supportive role. Operationally, this can take the form of compact, mixed-use communities that dramatically shorten trip distances and improve pedestrian and bicycling infrastructure. Compact cities are less reliant on private cars and minimize distances travelled, thereby conserving energy, land, and environmental resources. They are also more resilient, enabling them to better adapt to the vagaries and uncertainties of climate change and other global unknowns.

### **Accessibility as a priority rather than transport**

The core principle of accessibility is related to the notion of travel as a derived demand and transportation as a means to an end. Accessible cities not only put places (e.g. homes and workplaces, or ‘trip origins and destinations’) closer to each other, but also provide safe and efficient pedestrian and cycling corridors and affordable, high-quality public transport options. That is, they are accessible to all. Recasting the sector’s primary objective as one of enhancing accessibility invariably leads to a different set of policies and strategies, like transit-oriented development and the provision of highly interconnected bikeway networks. These strategies not only conserve land, energy and financial resources, but also help the poor and those without private motorized vehicles to access goods and services within the city. In short, accessible cities are inclusive and resourceful.

### **Enhancing the linkage between land use and transport**

While the pitfalls of overreliance on technological and supply-side solutions to urban mobility are acknowledged, the important role of transport cannot be discounted. The missing ingredient causing the observed pitfall has been the disconnection between the essence of land use and the logic of transport. This connection needs to be re-established for sustainable urban mobility to be achieved; and it can only be effectively initiated at the highest level – through national urban policy initiatives. Indeed, the national urban policy is given prominence for this connection mainly because of its role as a statutory instrument that not only articulates a vision for urban development, but also defines the relationship among sectors, agencies and stakeholders. When properly articulated national urban policy offers the most authoritative instrument for elevating the linkage between land-use and transport planning beyond the bureaucratic and political compromises often reached. The integration is not simply a technical exercise at the local level. It represents a totality of how cities are at a given time, while also identifying the parameters of their future growth. Substantive guidelines are therefore required to ensure effective harnessing of the dynamic synergy of a given national urban system.

An integrated approach to land use and transport harmonizes planning of the two processes out of the bounded confines of specific ministry and departmental mandates, turning them into a coordinated and integrated exercise at policy and operational levels. It shifts the focus of planning from placement of structures and designation of land use to that of enabling the realization of people’s needs and everyday functions in the most efficient and sustainable manner. Within this approach, the key challenge is therefore not merely to overcome the

separate handling of transport and land-use planning; or even to ensure a juxtaposition of the two. Rather, it is to foster an organic integration of the entire continuum of a multi-modal mobility within a holistic and sustainable land-use system where dynamic synergies are harnessed; interconnections are promoted; and functionality optimized. In the whole process, the aspect of design serves as a main bridge linking the key dimensions and attributes for ensuring sustainability and accessibility. LuxInnovation Cluster report: <http://link.luxinnovation.lu/m/27551c4238c04c5990ded656a460a238/DB588E49/49CD023A/092017n>

## **6.3 Buildings**

### **Construction**

With one or two exceptions, one sector which is hanging on to current methods of operation and reluctant to change is the construction industry. Very conservative and traditional in its approach, it still relies on a traditional range of capabilities and two dimensional processes, the majority non-digital, to manage its activities. We would argue that the construction industry needs to overcome its reluctance to change and seize the innovation being applied in other areas to drive efficiency, generate sustainability, improve safety and reduce costly waste (material and structural waste).

#### **Main topics developed:**

- The importance of R&D
- Prefabrication & more industrialized processes
- The importance of renovation
- Sustainable construction and people centred design
- Skilled labour shortages ahead
- Infrastructure is an important part of construction
- Digitalization is the key

#### **The importance of R&D**

Until recently, the construction industry has suffered a technology by-pass, relying on centuries-old processes and procedures to manage dazzlingly complex modern projects. Today, however, the same software applications that make manufacturing industries so efficient are being deployed in building construction with transformative results.

To increase efficiency, eliminate waste, and increase profit margins, companies in the construction industry, as well as governments, must invest in R&D. If they do not, they should be prepared for extinction at the hands of more technologically sophisticated competitors from within or beyond the construction industry (and most probably non local competitors). Those that have invested in R&D have achieved cost reductions and enhanced quality. But local construction companies strongly investing in R&D are far too few.

Construction industry investment in research and development is among the lowest of any major industry. But when you start to innovate with technology to drive the use of standardized products and modularized processes, productivity gains are spectacular. 3D simulation technology has made significant inroads into architectural design and fabrication to excellent effect, but process modelling is virtually still non-existent.

## **Prefabrication**

Process models for construction have remained largely the same for hundreds of years, with highly skilled labour carrying out tasks for which they are over qualified 80% of the time. Simply externalizing work, i.e. making components in a factory, enables manufacture by lower skilled operators. This cuts cost, improves quality, reduces on-site re-work and allows total operational control. In this system, work on site consists in assembling of quality-assured parts, each guaranteed to be fit for purpose. Disassembling gets achievable and more efficient.

The lack of the enhanced quality control and associated industrial or semi-industrial methodologies in construction has contributed to waste and to soaring prices. But this is about to change because new technology oriented companies are looking at construction as a huge opportunity. We are also seeing contractors joining into larger groups. They are changing building and construction from a cyclical, low-tech, physically exhausting and unsafe industry to one reinventing itself and attracting new innovative talent.

## **Sustainable Construction**

According to the main principles of sustainable construction are the following:

- Maximization of resource reuse;
- Minimization of resource consumption;
- Use of renewable and recyclable resources;
- Protection of the natural environment;
- Creation of a healthy and non-toxic environment;
- Creation of quality in built environments.

Sustainable construction embraces three main dimensions namely social, economic and environmental in contrast with the traditional perspective, where the main concerns were economy, utility, and durability. The social dimension addresses issues pertaining to the enhancement of people's quality of life. The economic dimension addresses economics issues such as employment creation, competitiveness enhancement, lower operating/maintenance costs, employment creation, high quality of working environment leading to greater productivity and many others. The environmental dimension deals with the design, construction, operation/maintenance and deconstruction approaches that minimize the adverse impacts on the environment such as air emissions, waste discharges, use of water resources, land use, and others.

## **...and refocus on people**

The places and spaces we all occupy, which enable us to continue to thrive and prosper as a society, are defined by the materials used in their construction, and the needs and demands of those who occupy them – especially when we consider, that we spend approximately 80% of our time in buildings. How they perform, how comfortable they are to be in, and the impact they have on our health, wellbeing and outlook are increasingly important issues we need to consider in the evolution of our built environment.

***We urge to refocus on people, quality, wellbeing, safety as an overall topic in the construction sector.***

### **Skilled labour shortages**

The construction industry is bracing for a dramatic reduction in workforce. This is especially true in Luxembourg where almost all the workforce in the sector are either immigrants or commuters.

It is unclear for how long the sector can still rely on immigration to renew the necessary workforce (as children of those immigrants almost never follow their parents steps to embrace a carrier in the construction sector and as salaries are (slowly) rising in the other European countries (Portugal, Poland,...)).

By 2020, millennials are expected to represent half of the global workforce – many with little to no experience or interest in the construction industry. The combination of increasing project complexity and decreasing experience is a risk multiplier, increasing the risk of deliverable delays, quality construction problems, and employee safety concerns.

Despite the importance of adapting to the new opportunities presented by technological advances, it's essential we don't forget the human skills that are still so vital to the industry. New technologies come with their own unique set of challenges as well as advantages, and when technology fails, human ingenuity and hard graft can be the only thing standing between a completed project and significant delays. The construction industry has embraced new technology with varying degrees of enthusiasm, but losing the human crafts that preceded these technologies would be a major loss to the industry. Even as the means by which buildings are designed, mapped and constructed develop, the beating heart of the industry has remained with the workforce. Companies, clients and the industry as a whole would do well to remember this. Construction contractors have regularly cited finding skilled labourers as one of the most significant challenges facing the construction industry today. Despite significant growth, the industry has access to fewer workers than in pre-recession 2008. Partly a result of the severe layoffs witnessed during the recession, this statistic also points to the growing number of young talent seeking employment in less labour-intensive, and more stable, markets.

### **Infrastructure investment**

Infrastructure has almost completely been forgotten in the TIRLux study. Or Infrastructure has a huge potential for the construction sector.

Infrastructure is one of the great enablers of economic productivity. Energy, transport, utilities and telecommunications networks, along with education, housing and health facilities, have underpinned economic growth and our quality of living since the first industrial revolution. It is a blueprint that has served us well. But new investment is no longer delivering the productivity improvements that it used to. And while the 3d industrial revolution is sweeping through the wider economy, infrastructure has been stuck in the past. This must be changed. For infrastructure, the technology revolution is to be seized. It should be welcomed but governments will need to act boldly to realize the full economic and social benefits of this transformation.

### **Renovation: the biggest challenges!**

The necessary contribution to the implementation of the Paris Global Climate Agreement requires Luxembourg to “modernize” its renovation strategy of the existing buildings (older than 10 years). The current model is based mainly on grants which allow the implementation

of “*low hanging fruit*” solutions. This model cannot lead to net zero energy/carbon building stock within the next decades.

It is first important for policy makers and industry to acknowledge that the driver behind energy renovation work is very often providing more/better comfort for its occupants and/or increasing the market value of the property. It is therefore important to go beyond energy use in the use phase and to include other sustainability criteria such as resource efficiency, different comfort levels (lighting, acoustics, olfactory...), recyclability and health impacts. This would foster innovation in sustainable construction materials. The second step is to have a clear, measurable and easy to monitor target. The current nearly zero energy and major/deep renovation targets have created confusion among many stakeholders. Moreover, this confusion has led to inertia in innovation.

Solutions implemented today are those invented years ago, while the world is moving towards the use of drones, 3D printing and full automation of buildings. In fact, the first 3D printing building was delivered in Dubai in May 2016 while Luxembourg is still struggling with data collection of energy consumption of its building stock. Combining 3D printing, scanning buildings with drones to establish the databases needed to design innovative solutions and sustainable energy renovation kits -per construction periods and building types-represent a unique opportunity for Luxembourg to release the 3d industrial revolution.

However, for this revolution to take place, innovative business models would be needed (for example for multi-owner houses (*co-propriétés*) in which renovation is often blocked by the complicated voting systems). The third step is, therefore, to organize the demand and the supply of energy renovation through a third independent party whose role would be to identify the risks and work upfront on their mitigation and also to organized bespoke financing.

A good example of such a facilitator is the one established in the Netherlands (*Energie Sprong*) for net zero renovation of social housing. Expanding this model to all type of buildings should trigger large scale renovation projects and consequently lead to economies of scale.

### **The key is digitalization**

Unlike other industries, the Engineering and Construction sector has been slow to adopt new technologies, and has certainly never undergone a major transformation. As a result, productivity has stagnated over the last 40 years, or in some cases, even declined. This unimpressive record looks set to change very soon, and very dramatically. In fact, profound changes are already taking place – though not yet on a sufficiently wide scale – in many aspects of the construction industry.

The key is digitalization. More and more construction projects are incorporating systems of digital sensors, intelligent machines, mobile devices, and new software applications – increasingly integrated with a central platform of Building Information Modelling (BIM). The challenge now is to achieve widespread adoption and proper traction. Wherever the new technologies have properly permeated this fragmented industry, the outlook is an almost 20% reduction in total life-cycle costs of a project, as well as substantial improvements in completion time, quality, and safety.

Technological advances are now revolutionizing almost all points in the life-cycle of a built asset, from conceptualization to demolition. Digitalization is transforming all three major life-cycle phases of construction projects. Consider the following scenario – no longer futuristic, but “here today”, though its building blocks are still distributed patchily over disparate projects.

We most probably will see in the very near future drones that survey and inspect the construction site or 3D printers prefabricate many of the building components. GPS and radio-frequency identification (RFID) are used for tracking the materials, equipment, and workers, in order to then optimize flows and inventory levels. Robots and autonomous vehicles will do much of the actual building work. 3D laser scanning or aerial mapping is used for comparing work-in-progress against a virtual model, thereby enabling prompt course corrections and minimizing corrective work.

Take the case of a Japanese equipment manufacturer that has developed fully autonomous bulldozers, led by drones that map the area in real-time to provide data on the workload. During the Operations phase, embedded sensors continue to monitor any given part of an asset, checking for deterioration, facilitating predictive maintenance, and continually updating a central database. Augmented reality is used for guiding maintenance crews. Big data – on traffic movements, electricity consumption, and so on – are collected digitally, and are subjected to advanced analytics, in order to optimize decision-making and generally boost operational efficiency.

### **Gathering momentum**

On average, uptake of these transformative technologies has been slow initially. They have faced some resistance to adoption, and some companies that do deploy them have struggled to capture all the potential benefits.

The obstacles are being overcome, however. More and more companies are now embracing the opportunities, with productivity starting to rise and promising to soar.

Adapting education programs (high school and Uni Lëtzebuerg), attracting new skills to develop the necessary workforce, develop R&D programs ...

## **6.4 Industry**

The TIRLux chapter about Industry is clearly structured and practical. It gives milestones and a timeline towards the required developments. Reviewing this chapter revealed some inconsistencies and gave rise to the following remarks:

- Steel is not recyclable *ad infinitum*. Steel is recyclable a few times, with properties degraded each time. Car bodies and similar high class items cannot be produced out of recycled steel.
- The steel industry will not totally reduce the CO<sub>2</sub> emission generated by blast furnaces when moving towards more environmental friendly electric furnaces. Because the proportion of electric furnaces must remain below 65% - otherwise the down cycling pollution becomes too strong. Blast furnaces must remain part of the landscape.

- Wind mills will not need significantly more steel. In the long-term, wind mills will reduce or even replace other energy production plants as power units from coal, gas or petrol with a similar need of steel per kWh. The total need of steel is directly linked to the demands of a growing (world) population.
- The huge differences in the recyclability of the diverse plastics are not correctly assessed. The profitability of the different recycling processes varies with the price of petrol (ex.: PET).
- A onetime recycling process of a product must not be defined and considered as recyclable.

## 6.5 Finance

To fully comply with the logic of the 2030 Agenda, Luxembourg should evolve as a leading financial centre. According to the Rifkin model, information and communication technologies (ICT) will affect finance by more than one revolutionary process and will have a great impact on shaping new business models – such as the “*Finternet of Things*” (the Financial Internet of Things).

The economic and financial evolution is not just driven by the sole ICT factor. The CSDD is convinced that the evolution of classical business models also undergoes a shift of paradigms with the emergence of a new and consistent concern for socio-economic and environmental sustainability as outlined by the Luxembourg Financial Working Group (FWG). This is exemplified by the proposed key idea (and practical solution) described as “*an emerging coalescence around the establishment of a Luxembourg Sustainable Development Finance Platform (LSDFP)*” (page 256 of the TIRLux report). The platform adequately addresses the question of project financing as it positions itself in a very open and transparent way. This is a highly effective way of developing an accessible and user-friendly tool for both project promoters and financial contributors/investors.

As such, the platform tackles the problem of “access to finance for everyone” and other risk management services (such as insurance) which are keystones for providing and fostering project financing. The platform creates a virtual market for both demand and supply and brings both parties together in an efficient way leaving the long quest for potential financial resources and/or support and/or partners behind. Obviously, the lack of funding solutions for projects is probably the biggest reason projects don’t move from the planning stage to implementation. This leads the CSDD to address the key question of **the nature of these investable projects** - the nature of the projects being the essence of the proposed solution.

Historically seen, “money attracts money” is the principle of a clean functioning market in finance. It is a self-protecting tool for financial institutions in their roles as lenders and creditors with the promotion of such instruments as back-to-back guarantees or reciprocal credits both providing secured income for financial institutions as well as serving as a tax deductible instrument for the borrower. It is based on the most common method for financing a business: “savings” or if none available “friends and family” to secure project funding and credit lines. New businesses are often turned down for bank loans as aspiring entrepreneurs lack the capital to launch. Risk as such is solely measured by the means of reimbursement of the initiator in case of business failure. Today, the landscape of financial investors changed and alternative financing methods for start-ups appear.



An entire panoply of financing possibilities has emerged because of high-profile success stories: venture capital, start-up funding, seed capital, crowd financing, microfinance, venture philanthropy, and business angels. These new financial instruments comply in form with known market instruments, but – and this is the new dimension and reality – these instruments are adapted to replace the current stringent commercial terms based on return, profit or outcome to align with the social objectives of the projects. Beyond these or instead of risk based concerns questions such as... *What does the investor want to achieve with his investment? What is the impact of the investment? Does the investment foster sustainable development?* become issues and realities. This is where a series of new investors with a myriad of other concerns and new criteria enter: social responsibility, green finance, sustainable growth all shifting away from the initial profit driven concern. All these questions are deeply anchored in the 2030 Agenda for Sustainable Development. Due to this large diversification of financing possibilities appearing in the open market based on the IoT, the notion of return on investment has changed and has mutated from a pure financial dividend to a common, very practical and down-to-earth questioning about the final objective of the investment.

The CSDD identifies and hails the proposed platform as it not only attracts possibilities to mobilize financial means both on a national and international level offered not only by the financial sector in Luxembourg to innovative business models but also to foster and fund the social economy as it anticipates the needs of societal phenomenon. Obviously, one of the key evolutions of socio-economic sustainability is the growing influence of social economy, the **quest for impact** as a legitimate reason to do business.

Impact does not just become a tool to monitor positive effects as **a fundament of a socio-economic model/pyramid**. The desire to achieve impact, that is generating specific beneficial social or environmental effects **in addition to financial gain** as a result/return in all kinds of economic activity has become a leading trend in economy and finance and a new dimension for socially responsible investing.

Moreover, the CSDD highly appreciates and welcomes that the proposed model by the FWG for the Luxembourg Sustainable Development Finance Platform itself is the new legal form of “*société d’impact sociétal*” (SIS). This ambition is highly shared by the CSDD as this new legal entity subject to an agreement by the government is based on the creation and fostering of impact. Thus and irrevocably, the social and human character as such is at the base of this model as specified by the FWG.

Finally, the CSDD reminds that the commercial perspective (profit) is not in contradiction with and highly respects the pledge for social interest and corporate social responsibility (CSR). The paradigm shift taking place today is not a paradox of capitalism but is built on the fundamental economic principles. The bulk of impact investing will continue to be made by institutional or even public investors, but a range of socially conscious financial service companies, web-based investment platforms, and investor networks now offer individuals an opportunity to participate in it. The new platform will welcome them all on the journey to sustainable development.

“They (SIS) should allow for in-kind investment (i.e. skill sets) and return, as much as for financial investment and return and must not produce any counterproductive effects in relation to the other SDGs”.

***Building up on the work done on “green finance” (Climate Finance Taskforce and Green Bonds), Luxembourg should develop and explore possibilities offered by the financial sector in Luxembourg to form innovative partnerships in order to mobilize financial means and progress both on national level as also international on the pathway to sustainable development.***

## **6.6 Smart Economy**

*“A smart economy should reconcile the economy with the principles of sustainability through the use of ICT for the inclusive growth, economic diversification and social empowerment.”*  
(TIRLux, 2016)

Essentially ‘Smart Economy’ could be an umbrella category for the TIRLux proposal. It is, in fact, the ultimate goal of the strategy.

The overlap of this section with many other sectors, suggests that this is a ‘catch-all’ for solutions that have not fit into other sections. Otherwise FINTECH or MEDTECH or MOBILITY– or any of the other technology solutions that address economic or sociological development – would have their rightful place here as well.

‘Tech for Good’ is a popular theme in the impact investing world, where technology enables or extends positive societal impact. This can be everything from apps and sites promoting positive behaviour (like our program “*Meng Aktioun*”), to digitalizing organizations that are in the social sector, creating efficiencies or broader reach in terms of services or communication.

The stress on both CyberSecurity and Smart Cities are particularly relevant issues. As Luxembourg invests in digitalization and high performance computing (HPC), we need to be very vigilant about privacy issues that are delicate issues when our private lives become digital – and therefore accessible. Regulation, information, education and enforcement are critical issues to include in this working group.

Luxembourg should continue to invest in these efforts to use technology to encourage increased positive social and environmental impact. This must include training, support and financing solutions. Risks should be mapped out and addressed with relevant measures.

## **6.7 Circular Economy**

The TIRLux Strategic Study is mentioning an action plan without deep diving into this action plan. As a study without an action seems completely useless we strongly recommend getting to such an action on a short notice.

The action plan should include measures to eliminate all type of **barriers** (not only tax barriers) to fully integrate circular economy:

- Those barriers are on one hand inconsistent **legislation** and **regulations** (Luxembourg could implement a.s.a.p. the circular package given by

the specific European Directive ([http://ec.europa.eu/environment/circular-economy/index\\_en.htm](http://ec.europa.eu/environment/circular-economy/index_en.htm)) into national regulations...

- ... as well as **missing financial tools and structures** (enhancing financial tools for circular economy inspired businesses must be an absolute priority for the next years).

Policy makers need to address these issues and provide financial and business support packages that fill that gap. The regulatory barriers are manifold and cover various directives, legislations and regulations. Their nature can vary as for example:

- The lack of definitions and the occurrence of gaps in legislation
- Unclear definitions of targets in legislation, for example in the context of the Waste Framework Directive
- The definition of hard numerical limits in regulation, for example, considering both the REACH and CLP regulations
- Lagging or incomplete implementation or enforcement of legislation, notably of the Waste Framework Directive and the Exports regulation
- Different and conflicting national implementations of a legislation (most notably directives or national action plans), observed in the context of the Waste Framework Directive, the Basel Convention and the WEEE Directive
- Legislations that conflict each other because they represent conflicting values, for example with hygiene rules versus food waste.

Financial tools and instruments must be developed as circular innovation and the transition to new business-models is potentially “expensive” and most of those cannot be internally financed. Today most of the circular businesses are startups or SME’s. Young and fast-growing firms are particularly dependent on external financing that can come either in debt or equity form. Luxembourg must set up (or enhance) a complete financial ecosystem including incubators, grants, crowd funding mechanisms, business angels, venture capital, private equity and public financing to give access to finance to the local businesses in every stage of development and/or transition to a circular model.

In order to **coordinate the measure for public authorities** (communes) and private people we recommend the creation of a “resource agency” (cf. *EnergieAgence*) and/or *MyResource* (cf. *MyEnergy*) agency to raise awareness, deliver consulting and education on the circular economy and resources topic.

We also recommend the creation of “**raw material funds**” which, in a long term, are a way to limit or avoid price inflation on raw materials and guaranty the competitiveness of local and regional industries that rely on raw material. Those funds are supposed to rent the raw material they are investing in only to supplier and producer communities that are guaranteed ideally 100% circular.

Moving to a circular economy means **systemic change**. This requires regular evaluation of road map projects (to be listed publicly) and updating of actions. Change requires high-level policy actions and pilots that can be launched immediately. As a way of thinking the circular economy is growing strongly globally. It is seen as a source of innovations and becoming a leader in circular economy needs an up - to-date understanding of the international operating environment. We therefore recommend to strongly **join as a country global and international initiatives** like the “*circular 100 club*“ of the Ellen Mc Arthur foundation and to screen and get inspired systematically by the global movement.

Luxembourg disposes of a number of **renewable resources**, one of which is wood. We recommend to **develop forest based loops** in Luxembourg and the Greater Region, and to redevelop the total wood value chain. The expertise originally developed within the framework of the conditions surrounding Luxembourg's existing natural resources should be dictated by efficiency and scarcity. We should learn to utilize not only a complete and circular value chain (forest based) but also to utilize all the side streams of such a value stream. This expertise has existed in Luxembourg but got lost over the last decades. The wood cluster initiative recently launched must be a major actor and must be coordinated and/or fully integrated in the TIRLux process.

The TIRLux study highlights the benefits of the reverse logistics and the internet of things. We recommend developing from scratch the idea of an **Internet of logistics and transports (IoLT)** in which all actors (private, public, business...) are involved combining the ideas of logistics, mobility as a service, IoT...). Digitalization will be a key enabler as transport (combined passenger and goods) moves towards smart and easy to use systems that are based on sharing and services and subsequently much more resource efficient.

**Public sector** has a key role to play in the transition to a circular economy. Circular procurement has been highlighted by the TIRLux report. Besides procuring circular design products the public sector must shift away from product based service and experience, **move away from capital investment to leasing, performance and service arrangements** where it shows value for money. Another pillar of the transition of the public sector should be the development of **sharing assets** (buildings, furniture, office space, mobility, cars/bikes...) and using idle capacity within the system instead of buying new- ensuring assets are managed properly and used as much as possible by sharing where appropriate.

We strongly recommend giving **key projects more importance**. Those projects (pilot projects, hi-visibility projects) are a key to the transition towards a circular economy. Pilot projects are key for awareness rising and learning "by doing". Pilots are phasing one development trials that further the circular economy that can be implemented rapidly. Pilots make it possible to disseminate existing innovations and best practices.

Our economic system is built on the notion of growth in GDP, which, as presently organized, requires an ever-higher throughput of energy and materials. This dynamic lies at the root of our social and environmental problems. GDP is a quantitative indicator and says nothing about the qualitative dimensions of growth. CSDD recommends to the government to make use of the indicators set measuring the "well being" elaborated in common by the CES and the CSDD in 2013 in order to develop a new, complementary and more **qualitative indicator for economy activities**. This should seek to enhance and maximize human wellbeing (within the given boundaries). The new indicator, besides the obvious "circular economy" issues should also implement measuring of redistribution of wealth and income (more fairly), promoting long term thinking and investment and maintaining a resilient and strong economy.

A circular economy aims to **develop local and regional job** through dismantling, disassembling, repairing, reassembling, upgrading, and transforming products. A strong and new logistics (*see*: Internet of Transport and Logistics) has to be locally developed. The stake are high to develop future **blue collar jobs** and the action plan should be very regarding the

development of opportunities for new jobs in various fields (awareness rising, education,..) in order that companies can quickly find the necessary skilled workforce.

The strategic measures include 2 very strong measures related to agriculture and food (measure 6 and 7). They are key in a sustainable world but should be coordinated with the “food” work stream.

The study does not really highlight a clear roadmap, visions and targets. We strongly suggest establishing or clarifying a vision for Luxembourg (2030?) including targets/objectives on a short notice. *“If one does not know to which port one is sailing, no wind is favorable”*

## 6.8 Prosumers and Social Model

**Collaboration:** The ‘prosumers & social model’ chapter of the TIRLux study addresses a number of issues concerning the ‘software’ the TIRLux strategy will need in order to boost Luxembourg to its smart green Third Industrial Revolution era. The authors describe trends in terms of the Sharing economy and the Collaborative commons and draft a picture of the ‘*prosumer*’, the citizen that consumes products and in a peer to peer exchange can deliver to or get products from other citizen. In this new world 3.0 market capital, ownership, consumerism, competition and intellectual property make (partly) room for social capital, access, sustainability, collaboration and open sourcing. The collaborative spirit described is coherent with the Sustainable Development Goals agenda because collaboration and partnerships are keys to progress on the SDGs.

**Collaborative commons:** The TIRLux chapter on ‘prosumers’ puts much emphasis on the rise of new forms of entrepreneurship. The CSDD would like to stress the need to integrate a broader view so to integrate the overarching resilience aspect into TIRLux. In fact, beyond market based entrepreneurship, the early 21st century sense of crisis triggers a re-assessment of lifestyle, values, and human well-being. Scenarios that only focus on large technological, but neglect the importance of social and cultural changes, are in the longer term likely to be less viable than scenarios that are rooted on a comprehensive set of conditions for a resilient future: an analysis that is based on a combination of planetary boundaries and development goals. Bottom-up diffusion of changes in lifestyle and values, along with the organizational power of more globally oriented citizens are pushing for a great transition towards a strengthened international governance, human fulfilment, social justice, and respect for nature. Rifkin predicts a future economy where demonetized collaborative commons are at the core of production, and market functions operate at the periphery.

**Commons and P2P systems:** Self-organized individuals and companies distribute money, knowledge and control in a collaborative environment. They develop Commons and Peer to Peer (P2P) systems based on the practices and needs of civil society and the environment it inhabits, evolving away from obsolete, centrally planned systems or the competitive dictates of market economies. Peers freely collaborate with one another to create value in the form of shared resources, circulated in the form of commons. The Commons are social system for the long-term stewardship of resources that preserves shared values and community identity. It is a self-organized system by which communities manage resources (both *depletable* and *replenishable*) with minimal or no reliance on the Market or State. The Commons also represent our collective wealth including the gifts of nature, civic infrastructure, cultural works and traditions, and knowledge. The TIRLux report summarizes a set of proposals that

deal respectively with an ‘economic’ and a ‘political’ infrastructure for the new commons-based value regime. The CSDD would like to reinforce this vision and encourage the development of new modes of exchange and production that integrate the requirement of shared knowledge and mutualisation of physical infrastructures, fair distribution of value, and compatibility with the ecosystems on which we depend.

**Normative framework:** Innovation needs new institutions, infrastructure, laws and platforms so creativity unfolds in the interest of the common good. The authors of the TIRLux report insist on the importance to regulate in order to keep social security achievements of modern society and as well protect people from work overload and exploitation and make sure they do not undermine the social system either. The CSDD very much supports the claim for regulations in order to protect people (see also chapter 3.4 in this paper concerning safeguards for social justice), but in the same time warns from ‘overregulation’ in order to avoid the suffocation the sense of emergence and experimentation that potentially unleash innovation and creativity. In order to adapt the regulative framework step by step the Government could convene a consultative commission onto which a ‘*community of practice*’ with a heterogenic set of actors would be invited to participate. Along those lines the authors of the TIRLux report also reflect on the value systems that should not be neglected in order to keep of the human dimension of the new TIR era.

**Governance revisited:** Governance models at all levels (including Government as well as all political processes) need to be adapted so as to integrate the side effects of the collaborative economy (‘flat hierarchy, lateral power and network organization’). Community supported agriculture and energy cooperatives are cited as examples of the collaborative model, but examples are also given from other sectors. However the distinction in terms of motivation between different future scenarios for a collaborative economy later in this chapter unveils important distinctions between different economic and social forms of the sharing/collaborative and rental/on-demand/gig economies.

Based on work from the P2P Foundation, the authors highlight ‘tensions between centralized and distributed control of the infrastructure; and the polarity between capital build-up or flow and Commons accumulation or circulation’. This distinction is important when it comes to motivation that drives actors to innovate and develop projects.

**Resilient communities:** In that part of the ‘prosumers & social model’ chapter the authors briefly mention the issue of resilient communities, without however unlocking the potential behind this notion. Unfortunately this concept is poorly developed in Luxembourg, but deserves attention and support by public actors and the State.

- **Resilience:** A resilient system (a city, an ecosystem etc.) is one that has developed capacities to help absorb future shocks and stresses to its social, economic, and technical systems and infrastructures so as to still be able to maintain essentially the same functions, structures, systems, and identity. A significant revision of current thinking is embodied by planning and design principles that have the potential to create more resilient cities, more resilient communities, and more resilient buildings. What is needed here a new models of participatory planning that integrate residents’ needs, resources and capabilities in order to design cities that are better able to cope with disaster, climate change, economic crises etc. While this approach is recognized by international agencies and world cities’ coalitions to be crucial in the developing world, Luxembourg needs to address the same challenges in terms of resources

depletion, social inequalities and climate vulnerability. Resilience strategies are by definition never fixed in time but have the adaptive capacity at their very core AND they need to be designed for the common good and not to serve the interests of just a few. Acting in the light of ‘resilient communities’ obviously needs to make sure communities can thrive in the tension field between freedom of experimentation and obligations to respect a legal framework. It also necessitates State actors to fulfil its role of welfare state. And it triggers private sector entrepreneurs to act beyond profit and take their responsibility for the common good.

- **Communities:** Although there is a myriad of definitions of what a ‘community’ is supposed to be – ranging from sharing a specific locality, government, cultural and historical heritage, practice (such as virtual communities) etc, for the sake of simplification we rather concentrate collective action in order to make our societies (villages, cities, country, enterprise etc.) resilient to cope with change. In that respect ‘community resilience’ in the context of TIRLux brings the notion of collective action and collaboration, of stewardship for the world’s (natural) resources, and of participation in order to address the range of needs emerging in our society. There needs to be safeguards in order to misuse the term ‘communities’ to legitimate further increased inequality, fragmentation and social isolation. So we understand the term ‘communities’ rather in an integrative and socially just way.

**Progressive cities:** The CSDD would like to highlight the ‘Resilient communities’ model because it has the potential to unfold adaptive solutions for the future. Beyond offering ‘business models for retaining locally created value’, cooperative models are likely to be more needs based and hence develop resilience models that can be available for peer communities around the globe. There are many examples how by means of online platforms practical knowledge and experience can be disseminated concerning citizen owned business models (such as cooperatives that can source money even when public money is not available), urban agriculture (that bears great potential to feed humanity), traditional plant seeds dissemination (as preserving plant diversity for the humanity and in a common interest) and the like.

*According to Bauwens et al. (2017), ‘... progressive cities worldwide are creating spaces for ordinary people to manage matters which most directly concern themselves as citizens. Cities like Gent, Bologna, Amsterdam, Barcelona, Belo Horizonte, Naples, Montreal, Lille, Madrid and Bristol are increasing transparency, enabling participatory budgeting, facilitating the creation of social care co-ops, turning empty lots into community gardens, co-creating skill and tool sharing programs, among many other locally relevant actions.’*

**A new working group under TIRLux:** While the TIRLux report addresses a number of ‘hardware’ issues that are helpful to embrace change and future challenges in a positive way (such as circular economy), the CSDD strongly recommends to put an emphasis on the PEOPLE aspect of change, in which ‘Resilient communities’ are a good starting point. CSDD recommends launching a new working group under the TIR Luxembourg to fill this gap. This might be a good opportunity to link the TIRLux explicitly to the experience on the ground around the "Pacte climat" and engage local authorities in the process.

## 7 History/Background

### What is CSDD?

The missions of the High Council for Sustainable Development (CSDD) are defined by article 4 of the Law of 25 June 2004 on the coordination of national politics for sustainable development. According to the latter, the Council will act as a forum for discussion on sustainable development. It will propose research and studies in all areas related to sustainable development and establish links with comparable committees of the member countries of the European Union. It will raise the widest participation of public and private bodies as well as that of citizens in the achievement of sustainable development objectives. Finally, it will issue opinions on any measures relating to the national policy on sustainable development taken or envisaged by the Government, in particular on the National Plan for sustainable development and on the implementation of the international commitments of Luxembourg.

The CSDD performs the above missions on its own initiative or at the request of the Government. The members are 15 personalities from the various sectors of the Luxembourg society chosen in reference to their knowledge, competence and commitment to society.

‘Environment and sustainable development advisory councils’ have been created following an EU-Directive. These councils are federated within a network of advisory bodies established by national or regional governments, the European Environment and Sustainable Development Advisory Council (EEAC). EEAC members, as the High Council on Sustainable Development (*Conseil supérieur pour un développement durable*, CSDD) offer independent advice to their respective national or regional governments and parliaments related to the environment and sustainable development.... With representatives from academia, civil society, the private sector and public bodies the EEAC network brings together experts with years of experience producing independent advice.

<http://legilux.public.lu/eli/etat/leg/loi/2004/06/25/n1/jo>

<http://legilux.public.lu/eli/etat/leg/rgd/2005/07/14/n2/jo>

<http://www.csdd.public.lu/fr.html>

### Recent work by CSDD:

The CSDD was invited by the Ministry of Environment to draw its opinion on the 2<sup>nd</sup> Climate Action Plan (CAP) dating from 2013 in order to help the Government preparing a 3<sup>rd</sup> **Climate Action Plan** which should be prematurely finalized in 2018. The CSDD’s input hereon was delivered in April 2017.

Furthermore the Ministry of Environment challenged the CSDD to assist Luxembourg in its transition towards the **Sustainable Development Goals** (SDGs) of the United Nations Agenda 2030 for Sustainable Development. Two working groups – ‘inventory’, and ‘communication’ – were established. One to register all the various initiatives already undertaken in Luxembourg from individual citizens, NGOs, industry, SMEs, schools, government, etc. towards more sustainability, the other to better communicate in a positive way the challenges but above all the benefits of sustainable production and consumption behaviours.



## 8 Definitions

### Sustainable Development Goals (SDGs)

The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.

These 17 Goals build on the successes of the Millennium Development Goals, while including new areas such as climate change, economic inequality, innovation, sustainable consumption, peace and justice, among other priorities. The goals are interconnected – often the key to success on one will involve tackling issues more commonly associated with another.

The SDGs work in the spirit of partnership and pragmatism to make the right choices now to improve life, in a sustainable way, for future generations. They provide clear guidelines and targets for all countries to adopt in accordance with their own priorities and the environmental challenges of the world at large. The SDGs are an inclusive agenda. They tackle the root causes of poverty and unite us together to make a positive change for both people and planet. “*Supporting the 2030 Agenda is a top priority for UNDP,*” said UNDP Administrator Helen Clark. “*The SDGs provide us with a common plan and agenda to tackle some of the pressing challenges facing our world such as poverty, climate change and conflict. UNDP has the experience and expertise to drive progress and help support countries on the path to sustainable development.*”

For more information on the background of the SDGs, see:

<http://www.undp.org/content/undp/en/home/sustainable-development-goals.html>

## 9 Sources

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- CSDD & CES’s Opinion on “*Well Being*” indicators (PIB-Bien être, 2013)  
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- Norry SCHNEIDER: “*Die Welt danach? Sie ist bereits im Entstehen!*“ in both “*Sozialalmanach 2017*“ by Caritas and a résumé in “*forum*” May 2017, Nr 373, pages 14-18
- Eric WEIRICH: „Die Rifkin-Studie: Zauberformel gegen die Wohnungsnot?“ in „forum“ April 2017, Nr. 372, pages 27-30
- <http://www.myfootprint.lu>
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<http://www.statistiques.public.lu/catalogue-publications/cahiers-economiques/2016/PDF-Cahier-121-2016.pdf>
- <http://link.luxinnovation.lu/m/27551c4238c04c5990ded656a460a238/DB588E49/49CD023A/092017n>

Among others the CSDD edited opinions on:

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- La durabilité des finances publiques (2008)
- Nachhaltige Politik zur Nutzung von Biomasse (2008)
- La vie au Luxembourg aujourd'hui et demain. Sondage réalisé par TNS Ilres sur mandat du CSDD (2013)
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- L'eau, une des préoccupations prioritaires du développement durable (2014)
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- CSDD Gutachten über den 2. Nationalen Klimaschutzplan mit Empfehlungen für den 3. Klimaschutzplan