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WORKING AND LEARNING IN THE WORLD OF CRADLE-TO-CRADLE (C2C) - AN EUROPEAN NETWORK ON EDUCATION FOR RESPONSIBLE LIVING

Minimising your footprint does not help; we need to do things differently. People have been trying to do things that are less bad for many years now, but that just delays the process. We will just destroy the planet a little later and that does not make any sense.

The project "Working and Learning in the World of Cradle-to-Cradle (C2C)" enables teachers to empower tomorrow's consumers to consume so called Cradle-to-cradle products and services. Cradle-to-Cradle (C2C) is a new, rewarding and very innovative concept used in more and more companies in Europe. C2C design is about creating continuous cycles of both biological and technical 'nutrients'. This means that products are made from pure components that are easy to disassemble, in order to create new products in both the biological and technical cycles. Manufacturing processes rely on renewable energy, conserve water and embrace social responsibility (CSR).

Therefore C2C fits in the European policy of achieving a Carbon Low Society and for New Skills for New Jobs.

Key words: *Cradle-to-Cradle, (C2C), waste management, consumer education*

I. INTRODUCTION

The described European Leonardo da Vinci Transfer of Innovation project enables corporate trainers and teachers on VET level to empower tomorrow's consumers to consume so called Cradle-to-Cradle (C2C) products and services. The consumers are allowed to be beneficial instead of less bad; it's about giving people a long-term goal and a positive vision of where to go. C2C is all about a positive agenda.

C2C design is about creating continuous cycles of both biological and technical 'nutrients'. This means that products are made from pure components that are easy to disassemble in order to create new products in both the biological and technical cycles. Manufacturing processes rely on renewable energy, conserve water and embrace social responsibility (CSR). Therefore C2C fits in the European policy of achieving a Carbon Low Society and for New Skills for New Jobs.

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II. CRADLE-TO-CRADLE IN EDUCATION GOES BEYOND SUSTAINABLE DEVELOPMENT

The first key aspect of C2C in education is to move away from teaching students (as future employees and as consumers) to feel guilty. We have faced a long period of all kinds of environmental disasters which has created a feeling that it would be better if the human race was not here. That's why people talk about minimising footprints. For education, however, that's not a very positive message.

If feeling guilty for being alive and being on earth is the basis for education, you will not be able to inspire students as future employees and as consumers to do new things. You can't be innovative working from guilt because you are trying to minimise feeling guilty. People become more creative when they feel appreciated and can live without fear. It is far more powerful to be proud of what you do. So the first, and far most important thing, is to tell students that we are happy that they are here.

C2C is about innovation, quality and beauty. Things are not beautiful when they are toxic. And it is not beautiful when people can not make a living either. Sustainability is guilt management from the past. Why would we want to be less bad, when instead we can be good? Instead of talking about minimising our footprint, C2C is about making a big and positive footprint.

In our opinion, the concept of sustainability is especially unattractive for education. Sustainability always remains within the realm of existing systems, i.e. it always wheels in the same paradigm. And if we stay in the same paradigm, we will destroy the planet. Minimising your footprint does not help; we need to do things differently. People have been trying to do things that are less bad for many years now, but that just delays the process. We will just destroy the planet a little later and that does not make any sense. C2C helps empower students (and their teachers to help them) to become engineers, designers, architects, chemists, economists, communications specialists, managers, product developers, marketers and urban planners because there is so much room to innovate that will affect the behaviour of consumers.

We need a change in education in all the different subjects. We need a range of skills to work together on solutions and for that we need a range of qualifications. To really make things work, we need C2C principles to be applied to all fields. C2C in education is therefore about taking students as they are and supporting them to become what they want to be. This means looking at a C2C society. It is about looking at what the role of mankind is on this planet. It is about innovation, a positive footprint, a system that allows us to be beneficial instead of less bad. It is about giving people a long-term goal and a positive vision of where to go. C2C is about a positive agenda [1].

III. THE PHILOSOPHY OF CRADLE-TO-CRADLE (C2C)

An improbable joint venture between an American architect and a German chemist led to the publication of a book in 2002, which gave a new impulse to the way we think about sustainable development. In *"Cradle to Cradle: Remaking the Way We Make Things"* Michael Braungart and William McDonough present a concept which lifts our ideas about sustainability to a higher level.

The traditional way of thinking about sustainability was established in the seventies of the former century when people started to realize that our current production and consumption system is damaging the environment. In the nineties of the 20th century, designing methods such as eco-design and measuring techniques such as LCA were developed with the aim of minimizing the environmental damage caused by human activity. However, according to Braungart and McDonough, we should not just be looking for ways to make things "less bad". Carrying on with the traditional 'Cradle to Grave'

production model will still lead to huge quantities of waste and pollution being produced. They propose “starting out by doing the right things”. This new perspective is rapidly gaining ground among the current leaders in sustainable development.

On the basis of the *Cradle to Cradle innovation framework* companies started making products with surplus value; products that have a positive effect on people, the environment and society. This innovation framework is helping us to find sustainable product solutions using the 3 “*guiding principles*” of C2C:

1. *Waste = food*: this principle envisages an infinite cycle in which products are designed and produced in such a way that they ultimately produce new products, or can be reintroduced to the biological or technological cycle;
2. *Use renewable and inexhaustible energy sources*, such as the sun;
3. *Celebrate diversity*; greater diversity leads to a more resilient ecosystem.

The realization of C2C concepts requires a considerable amount of creativity, financial resources and cooperation between the right partners. The 3 ‘guiding principles’ provide shared goals for this purpose. Maintaining the C2C philosophy and implementing it in an organizational process is an on-going, step-by-step development.

To obtain a clear structure and direction, a *roadmap* is often used to help us plot a path towards a future-oriented objective.

MBDC is the owner of the Cradle to Cradle trademark; EPEA has the right to use this trademark and assists companies in the certification process. The C2C Product Innovation Institute is licensed to certify products in accordance with the third version of the Cradle to Cradle certification chart, which is currently in progress [4].

IV. THE PROJECT: WORKING AND LEARNING IN THE WORLD OF CRADLE-TO-CRADLE

As said, the goal of C2C is to make better products which can be recycled as biological or industrial commodities which are the basis of new products. In this way companies save on energy costs, reduce their CO₂ emissions and there is no waste from new commodities. Companies contribute therefore to the EU policy to become a sustainable and low carbon society.

A world without waste is a great concept, but it will take a mind shift to turn the ambition into reality. Companies not only need to reinvent the way they make things. They also have to reorganize and re-think the way they work together. C2C products and processes can only be achieved by teamwork throughout the value chain, in open innovation, long term partnerships and with an open mind for Corporate Social Responsibility (CSR). In this way companies contribute to the EU policy of New Skills for New Jobs and are helping education to educate the workers of the (C2C) future.

All partners in the Leonardo da Vinci Transfer of Innovation project *Working and Learning in the World of Cradle-to-Cradle* i.e. in The Netherlands, Germany, Greece, the United Kingdom and Romania indicate that there is already a lot of learning material on C2C, but not on VET level. The links with CSR and ISO 26.000 are also not very well established.

There is not sufficient learning material, or no material, on creating more awareness for C2C with process operators, designers and middle management. The question on how to implement C2C in your own organization is not sufficiently answered. There are not enough opportunities given on going more in depth on C2C when needed.

In the participating countries networks on C2C exist or arise, but the connections between VET (level) and companies are not well established yet within these networks. Partners in the project also indicate that they want to have long lasting contacts after the project, mostly by way

of digital communication. The gained information and feed back is useful for them in their work in the existing national networks. Big companies and especially small and medium-sized businesses are interested in the opportunities C2C gives as an innovative and truly sustainable concept. It offers to safeguard the existence of their businesses and create new job opportunities with products that are safe for customers and the environment and have a good reputation and high brand value, resulting thus in strengthening their market position and increasing their share.

4.1. Aims and objectives of the project

The concrete aims and objectives of the Leonardo da Vinci project *Working and Learning in the World of Cradle-to-Cradle* are therefore as follows:

* C2C needs new skills for jobs on VET level for process operators, designers and middle & quality management. Competence based education can fulfill these needs by using new educational methods developed in Germany, in this case 'serious gaming'. Serious gaming will be the upbeat and anacrusis to training in the workplace and continuous learning. The end product is a course on C2C.

* Trained trainers and teachers take care of competence based education on C2C for employees in enterprises and for students in VET. The end product is a train-the-trainer programme on C2C.

* The trained trainers and teachers participate in new and existing networks on C2C. In this way, they can keep on working on C2C after the project is finished and keep updated on how employees and students can find their way with their new skills to (new) jobs.

The end product is a long term participation in new and existing networks.

In this way the EU policy on New Skills for New Jobs is implemented and the current situation is changed that there is no training on C2C on VET level. Also the long term participation in networks will change the current situation that the wishes and needs of business are not met adequately by VET training and education. The needs of the labor market will be better served and controlled because VET education and enterprises meet and work together in new and existing networks. Encouragement of cooperation between VET and the world of work is in this way highly strengthened and will meet this important European priority.

4.2. Learning material of the project

One of the famous founders of the Cradle-to-Cradle (C2C) concept, the German chemist Michael Braungart, is based in Germany. His institute EPEA Internationale Umweltforschung GmbH (International Research on Environmental Sciences) provides up-to-date and innovative content and knowledge for the C2C trainer-training and the C2C course. Another linked German institute EPEA Akademie is involved in the further development of the serious game on C2C and its link to training in the workplace. The innovations from Germany are transferred to other European countries. These innovations will be translated and adapted to the existing culture and situation in The Netherlands, UK, Romania and Greece.

All partners have contacts with (other) businesses and or their umbrella organizations. The scope of the businesses differs. There are big companies and small ones. There are forerunners and starters with a big interest in C2C. Mostly they operate in the chain of interior design like main partner Desso Carpets, but for example in Greece there is much interest in C2C in food design and on ISO 26.000.

What all companies would like to establish is a stronger European network on company trainings on C2C on VET level and on co-operation and regular updating with VET education. Real implementation of C2C in enterprises and VET starts with mind setting,

change management and quality management. Forerunners can help the motivated starters. Together partners like to adopt these settings into the trainer training and course.

All partners show interest in CSR and ISO 26.000.

So, the sector is interior design (new skills and jobs for process operators, designers and middle management), with European countries geographical situated in the North-West (Germany, The Netherlands, UK) and the South-East (Romania, Greece) and the joint perspective to adapt mind setting, change management and quality management to the different cultures and state-of-the-art in the different countries. In this process companies and VET education are supported by consultancy, universities and umbrella organizations. Important pedagogical material exists in Germany. It contains a vision of C2C, design principles, efficiency versus effectiveness, recycling instead of down cycling, material flow management, steps to develop a C2C product and much more. A simulation game (or serious game) tests and expands the understanding of C2C in a creative way. It prepares for the implementation of projects in the working place.

4.3. Methodological and didactic approach of the project

A quote from famous Einstein can explain our methodological and didactic approach in just a few words: "We can't solve problems by using the same kind of thinking we used when we created them".

The main goal of the didactic approach is to deliver in a interactive way a stepping stone for companies and VET that wants to start with implementing C2C in their own organization or in their curriculum. This means (new) methodology for rising awareness, mind setting and to give practical assistance and tools for change management and implementation and further consultation for more in depth activities.

Important skills to develop are change management, process management, project management and quality management. Employees and students have to reflect on their open mindedness, persistence, and what higher management wants with them and the organization.

The methodological approach is as follows:

- Reflections on how you see the future just out of your reach (for serious mind setting) and on the current vision/strategy of the organization.
- Information and knowledge about C2C and business cases and also about CSR and ISO 26.000.
- Playing the simulation/serious game for more understanding about C2C in a creative way.
- Assignments or your own project on how you are going to implement C2C in your own organization.
- Feed back and evaluation and excursions provide more hands-on information.
- At last there are possibilities for advanced courses or in depth consultancy by EPEA.

In testing the materials constant input of participating companies is asked (are we on the right track, what do you miss, what do you like to add, are we filling in the policy on new skills for new jobs, what does your future employee need (more), what kind of business cases etc.)

A pilot course for all trainers to be trained will be held in June 2012 for target users in The Netherlands. Also pilot courses are organized in each participating country for target users in that specific country. The target users for the pilots are new trainers to be trained from companies and VET, management and employees from enterprises and students on VET level.

4.4. The project consortium

In elaborating the policy on New Skills for New Jobs, the consortium has a right mix between companies and VET. They both function on an equal base. They are supported by

consultancy, training institutes and universities. The consortium is organized in a Core Unit, Trained trainers, Project management and Reference givers from companies.

- Core Unit: it is our experience in international projects that it is very effective and efficient to give tasks of developing the material and disseminate and exploit the results to a small group with enough means in time. The Core Unit is a mix of companies, VET and naturally the providers of the innovations to transfer. The Core Unit will also guide and coach the trainers to be trained.

- Trained trainers: a right mix of participants from enterprises, VET and universities will be trained by the Core Unit to become trained trainers for corporate training and training in VET. They come from all the participating countries. From the beginning dissemination tasks are allocated to them and they are asked to participate in new and existing networks in which they can function after the project has ended.

- Project management: it is our experience in international projects that it is most effective and efficient to concentrate project management and project administration in one organization. Because quality management is an important aspect of the project, we also want to have good quality in the management of the project itself. For this we asked an experienced partner from Romania to monitor and advice the project management in a independent way.

- Reference from companies: the input of companies is very important in the new skills for new jobs strategy. Companies are asked for reference if the educated target groups have added value for them. There will be reference during the courses, so continuous adjustments of the outcomes is possible during the whole project period. The influence of companies is also very important when it comes to dissemination and exploitation. Decidedly, after the project period the C2C course must have a commercial based future.

The world of C2C has prominently an international orientation. To meet the demands of the concept of C2C there is need for a chain of companies and suppliers who all have the same mindset on the life cycle of C2C products (and services). So, boundaries between countries are not at stake. They are - to tell the truth- more a burden in setting up efficient chains of companies. The new jobs for these companies and suppliers are also not helped when they meet boundaries. The same can be said about Corporate Social Responsibility (ISO 26.000).

Some companies and countries are more advanced in working with the C2C concept while others are lagging. But they all share the idea that C2C is the future and contributes to the EU policy on a Carbon Low Society. Also for reasons of competition and scale, the EU level is more important then the national or regional one [2].

Dutch Desso carpet company and Dutch VET Koning Willem I College are the key partners in the Leonardo project *Working and Learning in the World of Cradle-to-Cradle*. How they implement C2C in their organizations is described in the following paragraphs.

V. CRADLE-TO-CRADLE AT DUTCH DESSO CARPETS

Carpet, carpet tile and artificial turf manufacturer Desso is one of the leading companies in its field in Europe. Their Business Carpets division manufactures carpets for commercial locations such as offices, banks, retail units, public buildings, schools, universities, hospitals and care centers.

Desso's ambition regarding C2C is as follows: Cradle-to-Cradle is developing products and processes that will contribute towards a better environment and better indoor quality.

Desso is the first carpet manufacturer in Europe to adopt the C2C design philosophy. Their carpets and artificial grass will be produced using manufacturing processes that rely on renewable energy, seek to conserve water and embrace social responsibility. Their products are made from environmentally friendly, pure materials that are safe for human health and are

designed in such a way that they can be biologically or technologically recycled at the end of their useful lives. Prior to formal C2C certification being granted, products, materials and components must all undergo a rigorous assessment procedure. The initial stages of the certification process comprise assessing raw materials in terms of human and environmental health criteria and evaluating the manufacturing process according to recycling potentials, energy and water use and social responsibility. EPEA will be supplied with detailed information regarding all the materials involved in Desso's products and processes. At this point in time, 90% of Desso's polyamide carpet tile collection is C2C certified.

5.1. Needed competences at Desso

In 2007, when Desso started on their C2C journey, they needed additional expertise in the company – primarily chemical expertise at the design stage.

The marketing department also needed additional expertise on the basic C2C principles in order to be able to communicate the added value of the certified products. Special technical project teams were set up to develop new machines.

The key values encouraged throughout the organization – and required from every employee to ensure a successful C2C work method – are 'ownership', common sense, ambition and integrity. Furthermore, Desso have seen that employees are motivated and driven by being involved in this ambitious, strategic change of direction.

A large group of employees from Desso – from a variety of departments and disciplines – were given a training course and this expertise has since been transferred into the production processes. The company has found that it is one of the leaders in implementing the concept and therefore had to discover and tackle a lot of issues themselves in the early stages.

Employee commitment to the C2C goals is of utmost importance, along with a strong belief in the philosophy. If they can see for themselves that implementing C2C works and that the market responds positively, it will create great encouragement to move ahead.

Desso created a C2C awareness team tasked with raising awareness on sustainable issues within the organization such as waste management. The company strategy places C2C as the top concern for every part of the organization and has identified their production processes as the first area to target [3].

VI. CRADLE-TO-CRADLE AT DUTCH KONING WILLEM I COLLEGE (KWIC)

As a UNESCO school, the Dutch VET institute Koning Willem I College (KWIC) does a lot in the field of sustainable development and globalization. All the students are affected by it. C2C initiatives fit well in the school's policy and strike a chord with students and teachers alike. C2C is part of the training programmes on construction, energy and climate. It aims to get students acquainted with C2C and teaches them to think innovatively and creatively. First and foremost, the programme explains that companies are currently also involved in looking at the long term in a world of 9 billion people. All these people are getting older and increasingly want more comfortable lives, jobs and homes, which will result in scarcity of raw materials and energy. Students should therefore find a point on the horizon; something to work to in the long term. They learn how to forecast in order to be able to backcast. They learn to determine what steps have to be taken to finally get to that point on the horizon.

Questions to be asked in the beginning are: what is the ultimate goal in construction? How to build without using (fossil) fuels, without using (non-renewable) materials, without using land, without using water and changing air quality. So, zero energy, zero materials, zero land, zero water and zero air. But this is the conventional sustainable approach.

In C2C terms the approach is different from 'zero'. For example new questions to be asked are:

- Which products are made from defined post-consumer materials?
- How can the biological and technological cycles be separated? How Waste equals Food (and therefore are not contaminated) and how will the remains be reused in the technological cycle.
- How to use renewable energy?
- Less bad isn't good enough. Try to leave a positive footprint behind. For example, produce waste water that is cleaner than the water into which it will be discharged.

The assignment that follows the question session is to design a house based on the principles discovered in the question session in groups of four students. Students can take 20 minutes for this task. They then give a presentation to each other on what they came up with, followed by a discussion. This inevitable leads to a list of C2C principles.

The design will be free of offenders such as hazardous substances. That means that the students will draw up a list of all the elements that will be used in the design which have to be non-toxic and recyclable. Products should also be easy to collect, easy to up cycle and easy to reintroduce into the cycle. An outright ban on hazardous substances and completing cycles will require a great deal of patience.

6.1. Needed competences at KWIC

To get there, students have to re-think, re-organize, re-plan and re-schedule.

The principle in the program is that students take small steps because no one ever succeeded in being perfect from the very beginning. Make a start and improve at every turn. Act now because you don't have to be perfect from the start.

If the above is a success, you won't have to cut down as things will get better and become more fun. Finally, students are shown examples. For instance: How does Desso currently manufacture its carpets?

C2C is all about thinking creatively and innovatively. Students participating in this programme are incredibly enthusiastic and are keen to follow it up in their educational program. A first taste that promises more to come [1].

VII. CONCLUSIONS

On the basis of the C2C philosophy companies started making products with surplus value; products that have a positive effect on people, the environment and society.

C2C in education is therefore about letting students experience what their role is on this planet. It is about innovation, a positive footprint, a system that allows us to be beneficial instead of less bad. It is about giving people a long-term goal and a positive vision of where to go. C2C is about a positive agenda. A world without waste is a great concept, but it will take a mind shift to turn the ambition into reality. Companies not only need to reinvent the way they make things. They also have to reorganize and re-think the way they work together. C2C products and processes can only be achieved by teamwork throughout the value chain, in open innovation, long term partnerships and with an open mind for Corporate Social Responsibility (CSR).

In this way companies contribute to the EU policy of New Skills for New Jobs and are helping education to educate the workers of the (C2C) future. The needs of the labor market will be better served and controlled when VET education and enterprises meet and work together in new and existing networks.

The main goal of the didactic approach is to deliver in an interactive way a stepping stone for companies and VET that wants to start with implementing C2C in their own organization or in their curriculum. This means (new) methodology for rising awareness,

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Desso created a C2C awareness team tasked with raising awareness on sustainable issues within the organization.

C2C initiatives fit well in the KWIC's school's policy and strike a chord with students and teachers alike. C2C is part of the training programmes on construction, energy and climate. It aims to get students acquainted with C2C and teaches them to think innovatively and creatively.

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PRACA I NAUKA W ŚWIETLE CRADLE-TO-CRADLE (C2C) - EUROPEJSKA SIEĆ EDUKACJI DLA ODPOWIEDZIALNEGO ŻYCIA

Streszczenie

Minimalizacja śladu ekologicznego nie pomaga. Od wielu lat ludzie starają się mniej szkodzić, ale to tylko opóźnia proces (zniszczymy planetę nieco później i to nie ma żadnego sensu). Projekt "Praca i nauka „od kołyski do kołyski” Cradle-to-Cradle – (C2C) pozwala wykształcić przyszłych konsumentów poszukujących produktów i usług z grupy C2C. C2C to nowa, korzystna i bardzo innowacyjna koncepcja wykorzystywana przez coraz więcej firm w Europie. Oznacza, że produkty wykonywane są z czystych składników, które są łatwe do demontażu, w celu tworzenia nowych produktów, zarówno w cyklach biologicznych jak

i technicznych. Procesy produkcyjne opierają się na energii odnawialnej a także ochronie wody i innych zasobów. Przyjmują też zasadę przestrzegania odpowiedzialności społecznej (CSR).

System zarządzania jakością w tych przedsiębiorstwach (ISO 26 000) opiera się na społecznej odpowiedzialności; w przedsiębiorstwach stosowane będą zasady opracowywane na potrzeby kształcenia i szkolenia nowej europejskiej kadry systemu jakości. Dlatego C2C wpisuje się w europejską politykę kształtowania społeczeństwa ograniczającego zużycie CO₂ i posiadającego nowe umiejętności w miejscach pracy.

Słowa kluczowe: „Od kołyski-do kołyski”, (C2C), gospodarka odpadami, edukacja konsumentka