NEWSLETTER March 2013

The Consortium		
Grupo eSSentium	Fraunhofer IFAM	Solintel
ICV BC Istituto per la Conservazione e la Valorizzazione dei Beni Culturali – Consiglio Nazionale delle Ricerche	Neapolis University Pafos	EcoCo

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EDITORIAL

Welcome to the Month 12 edition of the **ECO-CEMENT Newslette**r. We hope this will provide an overview of the development of the project, and encourage you to become engaged with the project by following its progress, or even better by making contact with project partners and keeping in touch with those closest to your areas of interest.

As well as being distributed by email and hard copy, the newsletter is also available as a download from the project website at www.eco-cement.eu under the “newsletter” top-menu item.

We also welcome feedback from anyone interested in our project. Please select the relevant contact person from the list above. If your comment is about the newsletter itself, then please feel free to send your comments to lsanchez@essentium.com and tiano@icvbc.cnr.it

Laura Sánchez
Project Manager, Grupo Essentium

ECOCEMENT CONCEPT

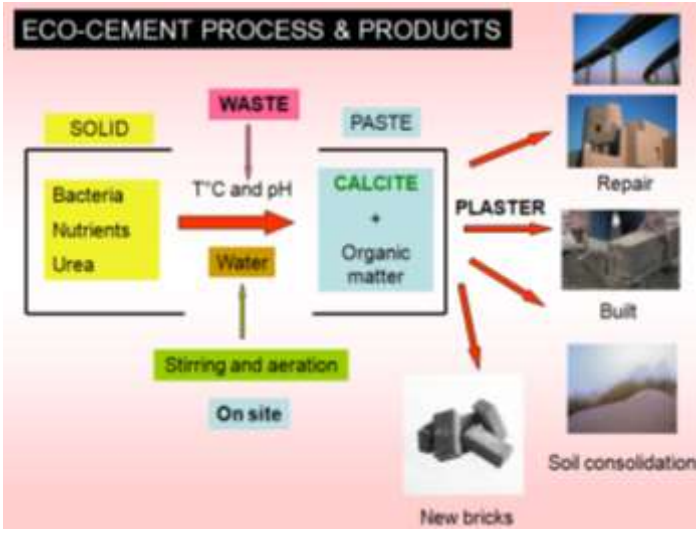
Increased public awareness of the threats posed by global warming has led to greater concern over the impact of anthropogenic carbon emissions on the global climate. The current level of carbon dioxide (CO_2) in the atmosphere is approaching 380 ppm (particles per million). Without drastic market, technological, and societal changes CO_2 concentrations are projected to increase to over 800 ppm by the end of the century. Since the pre industrial revolution, both changes in land-use patterns and the intensity of our development activities have had a notable impact on atmospheric CO_2 concentrations. The largest source of anthropogenic carbon emissions is from fossil fuel combustion, and energy consumption is rising due to our growing economy's demand for fuel. Non-energy related industrial activities also produce a significant quantity of process-related CO_2 emissions through the transformation of raw materials. Of these, cement manufacturing and iron and steel production are the most carbon intensive. Industrial waste is now global concern, causing environmental and economic harm. Industries are rapidly trying to find a solution, searching for optimal ways to manage waste and to change the most common practices as landfill or incineration. Industrial waste is very heavy burden for the environment, where a significant proportion of this industrial waste is attributable to construction and demolition waste.

*I*n order to mitigate the threats mentioned above (greenhouse gas emissions and waste management) **ECO-CEMENT** project will allow recovering valuable resources from industry, capturing carbon dioxide and transforming both products into ecological cement that can be use in construction or novel environmental applications.

The idea is based on the nature's way of creating natural formations through bacterial contribution to carbonate precipitation: extensive sedimentary rock masses as limestone or marble and calcareous sandstone in marine, freshwater and terrestrial environments. Natural carbonation occurs by the reaction between atmospheric CO_2 and alkaline materials, which is called "weathering". The difference of ECO-CEMENT respect to nature principles is that the microbial carbonate precipitation reaction takes a relatively short period of time instead of millions of years.

OBJECTIVE

The main objective of ECO-CEMENT is to develop novel bio-mimetic technology for enzyme-based microbial carbonate precipitation through the revalorization of industrial waste as raw materials, in order to produce eco-efficient environmental cement. The Bio-mimetic Technology will convert industrial waste, mainly cement waste and others by-products, into high strength, ecological cement using microbial carbonate precipitation via urea hydrolysis.



NEWS FROM OUR PARTNERS

GRUPO ESSENTIUM **SPAIN**	
Profile	**Grupo Essentium** is a leading European company in the cement industry under the sustainability principles. It has an international presence in more than 16 countries, the group working on several sectors, like construction raw materials, civil work and real estate development. The Essentium business is the extraction, fabrication, and commercialization of basic materials used on construction works: cement, aggregates, concrete and pre fabricated concrete. Such activities are complemented with construction, as well as promotion and development of real estate projects. This vertical integrated structure allows us to control and take advantage from all the added value chain. Recently, we have diversified our activities towards the Energy Sector, mostly renewable energies and water treatment, exploiting a registered trademark developed by our Internal Research and Development Department (R&D). The company is an expert on cement's production and trading. At the moment, and within the company's internationalization process, investments are being made mostly in the Mediterranean area, on thoroughly selected locations, using the state-of-the-art technology.
Main Role	Leader of WP1 and WP4 - Participation in WP2, WP3, WP6 and WP7. Leader of Tasks: 1.1, 1.2, 2.1, 4.2, 4.3 and 6.4 Main roles: Project Management Coordinator. Cement Industry facility provider. Technical requirements of industrial wastes for Eco-Cement production. Industrial Application of the developed technology, smart monitoring, control system and KPIs Control. Development of the Exploitation plan.
Key Staff	**Juan Alvargonzález Slater.** Mr. Alvargonzález holds a MSc. Mining Engineering Energy Major, from the Polytechnic University of Madrid (Spain). Mr. Alvargonzález has more than 8 years of experience in the management, planning, execution and control of cement facilities. He has worked as technical assistant of the Cement Division Director of Essentium Group. His responsibilities involved the technical management of various cement greenfield projects; • Turkey: Two clinker manufacturing lines with a capacity of 5,000 tdp, respectively; • Morocco: One cement plant in Morocco with a capacity of 3,000 tdp and a clinker grinding plant • Estonia: One clinker grinding plant Estonia designed for a production of 500,000 tonnes per year. Currently, Mr. Alvargonzález holds the position of Director of the Cement Division. He is the responsible for the financial and business strategy, technical and economical feasibility studies, contracts and the overall policy for the entire Division. His knowledge and expertise will be a strong value for the project. **Laura Sánchez Alonso**. Ms. Sánchez works as Engineering and R&D consultant inside Essentium. Ms. Sánchez has more than 4 years of experience in the management, planning, execution and control of quarry operations and 2 years in the coordination of European research and development funded projects. Currently, she is the Project Coordinator of 2 funded FP7 projects

	FRAUNHOFER IFAM **GERMANY**
Profile	**The Fraunhofer Society (FhG)** is a recognised non-profit research organisation which takes its name from the researcher, inventor and entrepreneur Joseph von Fraunhofer (1787-1826). Founded in 1949, the FhG comprises 62 Fraunhofer Institutes with 18 000 employees at 40 different locations in Germany as well as research centres and representative offices in Europe, USA and Asia. The FhG undertakes applied research in future-oriented projects with the aim of finding innovative solutions to issues concerning the industrial economy and society in general. Its services are solicited by customers and contractual partners in the industry, the service sector and the public administration. The organisation also participates in public funded research projects and initiatives of the European Commission and the German federal and "Länder" ministries. This places the FhG in a bridging position between industrial and academic R&D environments. The Fraunhofer Institute for Manufacturing Technology and Advanced Materials IFAM is the largest independent research group in Europe in industrial bonding and adhesive technology. The department "Adhesive Bonding Technology and Surfaces" performs R&D on multifunctional coatings, paints, polymer chemistry, nanoparticle applications, and plasma and lacquer technology as well as on adhesive bonding and surface analytics with the goal to develop application-oriented bonding system solutions for industry. IFAM possesses facilities for surface and structure analysis, electrochemistry and computational materials modelling. The work ranges from fundamental research to the introduction of new products to the market. Industrial fields of application area in plant engineering, vehicle manufacture, micro-assembly and in the medical, packaging, textile and electronics industries.
Main Role	IFAM is a member of the scientific team and has the lead of WP3. IFAM is leader of Tasks: 3.1, 3.4, 5.1 and 5.4. Main roles are the investigation of the microbial process and their optimisation for the production. Further the evaluation of the microbial performance in the cementation process. This includes laboratory test and the evaluation of the collected data in order to establish the overall efficiency for several type of cement.
Key Staff	**Dr Ingo Grunwald**, PhD in Biology, is working at the Fraunhofer IFAM since 2004 and is leading the Working group Bioinspired Material. His field of interest focuses on the fictionalisation of surfaces by means of bio molecules (e.g. management of cell adhesion, antifouling coatings, isolation and characterisation of marine adhesives, biomimetic anti-ice coatings, and antimicrobial surfaces). **Dr Katharina Richter**, PhD in Chemistry, member of the Bioinspired Material Group at the Fraunhofer IFAM. Katharina works with enzymes, peptides and ceramics. Since 2006, when she started as an intern in Mr. Grunwalds group she developed analytical skills in HPLC, NMR, MALDI and mechanical test development. **Linda Gätjen**, MSc in Technical and Applied Biology, is also member of the Bioinspired Material Group. She is working at the Fraunhofer IFAM since 2008. She is experienced in cell culture, analytical microbiology and antimicrobial testing, protein analysis, as well as biofunctionalisation of surfaces and test design for microbial investigations.

	SOLINTEL M&P SL **SPAIN**
Profile	**SOLINTEL M&P**, located at Spain, is a high-tech SME specialized engineering and consulting company. Our goal it is to satisfy in an effective way the necessities of the environment on engineering, innovating and energetic efficiency of industrial processes. We count with a large experience in the application of Computational Fluid Dynamics (CFD) in the modelling of industrial processes and equipment, including expertise in fluid mechanics, turbulence, heat transfer and other related physical and chemical phenomena. **SOLINTEL's** goal and strategy it is to apply a whole new analysis technique in order to improve EE and to reduce GHGE on industries, through the constant monitoring and optimization on every production process. The industrial sector is very diverse and involves a wide range of activities including the extraction of natural resources, conversion into raw materials and manufacture of finished products.
Main Role	Leader of WP2 - Participation in WP1, WP3, WP4, WP6 & WP7. Leader of Tasks: 2.2 and 6.1. Definition of the systemic approach and new value propositions for Cement Industry Wastes and its use as novel Raw Materials for Eco-Cement. Definition of the economical and legislative requirements of industrial waste for Eco-cement production and Identification of the knowledge, products and services generated during the execution of the Eco-cement project.
Key Staff	**Juan Manuel Mieres.** General Director of the company Solintel. He has worked as a technology consultant in over 150 construction projects in the international area on issues related to project management, construction procedures and material technologies. Former Director of ACCIONA R&D+I from 1994-2009. In 2009 he managed a team of 180 professionals and a budget of 47 million €. Professional associations; COTEC, ENCORD, SEOPAN, ESTTP, PVTP, JTI E2B, FIEC, EUROACE. Project management research experience: He has participated and managed over 50 projects of R&D, both European and Spanish, including 7 CENIT projects, being the coordinator of one of them, Prometheus, with a budget in excess 30 million Euros. Inside his project experience, he counts with projects such as: CENIT (Prometeo, Cetica, Sphera, Domino, Cleam, etc.), CDTI (Heartcrane, Códigos de Barra, etc.), FP5 (Safefloor, Megawind, Sgim 2001, Nanoconex, Con rep net, etc.), FP6 (Lessloss, Tunconstruct, Hp-future bridge, Medesol, etc.), Iberoeka (Ibercobra, Pumacon, etc.), PROFIT (Arfrisol, Ramsec, Futurespacio, etc.) Eureka (Comrehab eurocare eu140, eureka 26981, etc.). **Francisco Javier Royo Abancéns** is a Civil Engineer specialized in the field of Structures. He graduated with honors from Idaho State University (US). He has been deeply involved with reinforced concrete structures during his college career, obtaining the award for the 2011 Best Senior Design Project of the Engineering Department. The Project consisted on the design and construction planning of a 4 lane bridge made out of reinforced concrete material. He continued on with his specialization in structures and he is about to finish his Master Thesis in order to obtain a MSc. in Structures, Footings and Materials from the Polytechnical University of Madrid (Spain). His Master Thesis is within the scope of ECO-CEMENT project since some of the main ideas that he is working with are related with using the most eco-efficient cement available in order to design and construct more sustainable structures.

	ICVBC-CNR **ITALY**
Profile	**The ICVBC** - Istituto per la Conservazione e la Valorizzazione dei Beni Culturali (Institute for the Conservation and Value Enhancement of Cultural Heritage) of the **CNR** (Consiglio Nazionale delle Ricerche) is a public research instituite. It was founded in July 2002 through the merging of the three pre-existing CNR Centers for the "Study of causes of deterioration and methods for the conservation of works of art", which had been established in the early 1970s in Rome, Milan and Florence. Today the institute has its head office in Florence and units in Rome and Milan. As a public organization, the institutional tasks of the ICVBC include research, coordination, consultancy and training. The activity of the ICVBC focuses on research projects regarding the conservation and promotion of cultural heritage, paying particular attention to outdoor stone buildings, archaeological remains and artifacts, taking into consideration their historical, artistic, archaeological merits and environmental context. The staff of the ICVBC is essentially made up of researchers and technical experts with different scientific backgrounds. In its three operating units, the institute employs a total of 32 CNR personnel as well as 13 units associated personnel, and several research contractors. Specialized sectors include archaeology, biology, chemistry, engineering, geology, physics, and urban history
Main Role	The main activities of the **CNR** - **ICVBC** are: Scientific and Technological Coordinator; Task 3.2 Optimization of enzyme production. Task 3.3 Economization and optimization of the medium prior to scale up – Bioreactor design. WP7 Leader - Awareness, dissemination and training; Task 7.1 Awareness and Dissemination; Task 7.3 Communication plans and best practices guideline.
Key Staff	**Piero Tiano**, degree in Biological Science at University of Florence (1971) and since 1975, works as senior researcher and head of the technological unit at the ICVBC. His main activities are in the development of new diagnostic methods for the determination of the state of conservation of monumental stones and for the evaluation of the performance of conservation treatments applied (protective and consolidates). He has developed a novel stone consolidating treatment by bio induced calcium carbonate precipitation (Bioreinforce Project - Contract EVK4-CT2000- 00037). **Oana Adriana Cuzman,** Master Degree in Environmental Management, Industrial Chemistry Department "Ghe. Asachi" University, Iasi, Romania (2003). European PhD in Science for Conservation, (Project EPISCON) University of Bologna, Italy (2009). Research Contract at ICVBC, from October 2012. Main competencies: biotechnology applied in conservation, bio calcite precipitation and antibioufouling studies. **Emma Cantisani,** degree in Geological Sciences at University of Pisa (1999). PhD in "Science for the Conservation of Cultural Heritages" at University of Florence (2003). From November 2009 researcher at the ICVBC. Main competencies: mineralogical, petrographical, physical and chemical characterization of natural and artificial stones. **Silvia Rescic**, degree in Geological Sciences at University of Florence (1998),PhD in "Science for Conservation of Cultural Heritage at University of Florence (2008). From November 2009: Researcher at the ICVBC. Main competencies: development and validation of new micro-destructive devices to the assessment of the superficial mechanical properties of stone materials. Selection and validation of new inorganic products for stone, ceramic and earth building conservation. **Giuseppe Torzillo**, degree in Agriculture University of Florence (1976). Main competencies: growth, physiology and biotechnology of mass culture of photosynthetic microorganisms, design and development of bioreactors.

	NEAPOLIS UNIVERSITY **CYPRUS**
Profile	Neapolis University of Paphos offers a comprehensive range of undergraduate, master and doctoral programmes that reflect the philosophy of the University to develop a balanced portfolio of academic activities that combine and allow the creation of centres of excellence in the chosen academic fields in combination with research activities in European and International projects. The Centre for Environmental Studies that based in the University of the University address the environmental problems by conducting interdisciplinary research and teaching in areas related to improving the quality of life and protection of the environment (e.g. buildings energy efficiency technologies and renewable energy systems, sustainable development, environmental management, urban and rural planning, ecotourism, public health, entrepreneurship and economy.)Particular emphasis is given to the conditions of Cyprus and the wider Mediterranean area. The School of Architecture Land and Environmental Sciences aspire to be a centre of excellence in educating professionals in architecture, urban and environmental design, real estate and construction management. The civil engineer and landscape architecture undergraduate and postgraduate courses are going to start as well at Neapolis University. The School offers a forum for research into topical areas and contribute to policy debates. It develops research activities in the areas of biotechnology and environmental design, within the framework of the local and the wider Mediterranean cultures, in collaboration with local authorities, international organizations and research institutes. This perspective leads to the establishment of a program which includes an educational component that targets the development of the students' research skills, in order to involve them both as students and as graduates in the field of research.
Main Role	Participation in WP2, WP3, WP4, WP5 and WP7. Leader of Tasks: 2.4, 3.5, 4.1 and 7.2. Main roles: Eco-cement performance indicators achievement in the cement industry, Study of strength development through cementation trials. Integration of the Systemic Carbon Lean Solutions and Education and training activities
Key Staff	**Dr. Julia Georgi:** she is Associate Professor at Architecture, Land and Environment School and she is Director of European and Research Projects. Her past field of research is in biomaterials and road construction, slope stabilization as she was employed by Construction Company EGNATIA ODOS S.A. in the Environmental Department, for the Design and Construction of EGNATIA ODOS, which is the transnational Road from Adriatic Sea throughout Greece up to the boarders with Turkey. The last 10 years is dealt in more than 20 European Projects conserving Environmental and Landscape Programmes (INTERREG IVC, FP7, LIFE+), co-operation with other European Countries. Ever since she was until recently was offering her services, as specialist Landscape Architect, at the Greek Ministry of Environment Energy and Climate Change, where for the last 3 years was acting as the official representative of Greece in the LIFE+ European Project (budget approximately 300.000.000 € yearly) and at the same time was the Director of Environmental Awareness Park of Antonis Tritsis the largest park in Greece (120 Ha). Previously designed and supervised the construction of several projects of ATHENS 2004 Olympic Games amongst the Classical Marathon Route. **Dr. Elias Dinenis**: he is Professor is the Founding Professor of Finance and Risk Management at Neapolis University and its Rector. After spells at the London School of Economics and the London Business School, he became an Associate Dean at the Cass Business School at City University London, where he was also a Professor of Investment and Risk Management and Director of the Centre for Mathematical Trading and Finance. His research interests include portfolio strategies for institutional investors, derivatives valuation, risk measurement and financial regulation.

DWEcoCo **IRELAND**	
Profile	**Delap & Waller EcoCo** is an Integrated Sustainable Design Consultancy which provides a unique service to the building development, construction and property industries to create a more sustainable built environment. Delap & Waller's expertise spans from dwellings to education, health, retail, commercial and government projects. The current staff of the company has international experience and has worked in Ireland, the UK, Germany, Australia, USA and Canada. We are a multi-disciplinary company with a predominance of architects and our current focus is the retrofitting of buildings for sustainability and energy efficiency. Through continuous research our expertise extends beyond integrating 'building design and services' to include low energy building strategies and designs, low carbon construction methods, renewable energy systems, environmental selection of materials; energy auditing, innovative solutions for wastewater treatment; soil improvement, carbon sequestration, preparing sustainable policy papers for public bodies and research projects.
Main Role	Our role in the project is to undertake a detailed Life Cycle Analysis of the proposed Eco-Cement process and compare it to conventional Portland cement production and a number of innovative cements currently being developed. This LCA will provide the data required to develop innovative business models and plans for the commercialization of the process and products. We will also develop an IP strategy for the process to ensure the value of the innovation is protected for commercialisation.
Key Staff	**Jay Stuart,** RIBA B.Env. St. University of Manitoba; DipArch UCL, London; AADip. Architectural Association School of Architecture, London Jay is the Managing Director of DWEcoCo. He has over 30 years experience as an architect in Canada, the UK and Ireland and has worked on a large variety of built projects. He worked with the Energy Research Group, UCD in research and consultancy for 2 years. He has participated in a number of EU funded research projects in the field of sustainable design including the Europrosper and AVASH projects and is currently involved in the CETIEB, RETROKIT, and EFFESUS projects. Jay was Chairman of Ireland's *Building Regulations Advisory Body* from May 2009 to October 2012. **Sinead Cullen** is an architect who has been employed by DWEcoCo since January 2007. She has worked with a number of architectural practices in the US, Australia and Ireland since completing her professional studies in 1996 and has experience on a wide range of architectural and sustainable design projects. Sinead received her MSc in Architecture: Energy and Environmental Studies in 2008. Her specialist areas are sustainable construction techniques, sustainable material selection, Design for Disassembly (DfD), and Passivhaus design. **Dr Mark Hamill**, PhD in Chemistry from UCD (2012). Mark received his PhD, on transition metal catalysed rearrangement, from UCD. He is experienced in NMR analysis, chemical manipulation under inert atmosphere, report writing and scientific research. He is a new addition to DWE, having started there in 2013 as a researcher for the Eco-cement project."

SCHEDULED EVENTS IN THE PROJECT

Date	Description	Partners
May 2012		
8th – 9th	Kick-off Meeting - Fraunhofer, Bremen (D)	All
October 2012		
18th -19th	6th Month Technical Meeting - Pafos University- Cyprus	All
March 2013		
14th -15th	1st General Assembly - CNR ICVBC Florence, Italy	All
September 2013		
-	1st Review Meeting – G. Essentium. Madrid, Spain	All

PROJECT EVENTS

Conference events in which will be started to diffuse, in specialized scientific areas, the Ecocement concept and the first laboratory results

N°	PARTNERS	Title	Location	Date
1	IFAM – CNR ICVBC	FEMS 2013, The 5th Congress of European Microbiologists http://fems.kenes.com/	Leipzig, (Germany)	July 21-25, 2013
2	CNR-ICVBC	12th SGA Biennial Meeting S6.2A Construction materials http://www-conference.slu.se/sga2013/	Uppsala (Sverige)	August 12-15, 2013
3	IFAM – CNR ICVBC	EUROMAT 2013 Biological Materials and Biomineralisation including Bioinspired Synthetic Materials http://euromat2013.fems.eu/welcome.html/	Seville (Spain)	September 8.13 2013
4	To be defined	SAIE 2013 International Building Exhibition http://www.saie.bolognafiere.it/it/	Bologna (Italy)	October 16-19 2013
5	To be defined	9th International Masonry Conference http://www.9imc.civil.uminho.pt/	Guimarães, Portugal	July 7-9, 2014

The Ecocement group visiting the Vassiliko Cement Plant in Cyprus

PROJECT DEVELOPMENTS: *"Selection of industrial by-products as raw material for ECO-CEMENT"* [Work Package 2]

The ECO-CEMENT project is focused in one of the most promising alternatives to produce a Portland cement substitute: the "Microbial induced calcium carbonate precipitation (MICP)" by the use of ureolytic bacteria. These bacteria are widely available in the soil and natural environment, can be easily controlled and have the ability to produce cementation at a comparatively much faster rate.

The mechanism of reaction involves ureolytic bacteria that hydrolyse urea to produce carbonate ions and in the presence of free calcium ions precipitate calcium carbonate. Urea is needed as primary reagent. If the saturation levels of the calcium carbonate produced are sufficiently high, it will precipitate forming bonds and consolidating its surroundings in the MICP process. As these processes use naturally existing components for the carbonate precipitation process, the environmental impacts of this material will not be as strong as Portland cement.

$$CO(NH_2)_2 + 2\,H_2O \xrightarrow{Urease} 2NH_4^+ + CO_3^{2-}$$

$$Ca^{2+} + CO_3^{2-} \longrightarrow CaCO_3 \downarrow$$

The medium ingredients in biotechnology processes are a major cost factor, ranging between 10 to 60% of the total operating costs. The medium cost increases proportionally with the size of the scale up. Because of this, it is important to give due consideration to optimization of the medium prior to scale up. Given that biocementation process does not require ease of removal of medium components or use of a defined medium, we are able to look at a range of more economical components to replace the existing expensive analytical grade chemicals.

For the large scale production of ECO-CEMENT inexpensive raw sources are needed. Reusing industrial by-products as a source of calcium, urea and bacteria nutrients contributes not only to reduce the process costs but to minimise the environmental impacts associated to the disposal of such wastes so, waste revalorization has a dual benefit for the project.

Therefore, ***the objective of ECO-CEMENT Work Package2 is to investigate the use of industrial by-products and its potential to be reused in order to produce Eco-Cement.*** These sources are relatively much cheaper than the laboratory industrial medium but they would require some pre-processing which would add a small additional cost in order to reduce the presence of contaminants and non desired bacteria. The Work Package 2 has successfully finished and its main conclusions are summarized here:

- A reduction in the medium costs without loss of urease activity is possible by the substitution of laboratory grade yeast extract with different industrial by-products: *Corn Steep Liquor (CSL); Torula Yeast; Brewery waste yeast (BWY); Sludge Biomass from WWTP, and Lactose Mother Liquor (LML).* The project research suggests that LML can serve as the better ***nutrient source for the growth of the bacteria*** and also for calcite precipitation as the final level of urease activity produced is sufficient for cementation. LML is a good source of nutrients that can support growth and urease activity of *Sporosarcina Pasteurii*. The availability of this waste is guaranteed by a regular supply and abundance of dairy industries across Europe. ***Using LML instead of standard media does not only reduce the cost but also serves as eco-friendly technology to prevent environmental pollution***.

- As ***alternative Urea*** we proposed a commercial ***fertilizer*** with an average cost of 6 €/kg. It is clear that this is not a commercial by-product but it is cheap, even when compared with urea rich by-products that

require pre-treatments due to the presence of pathogens, viruses, etc. that increase the overall process cost.

- ***Cement Kiln Dust,*** hereinafter CKD, is the ***source of solid alkaline industrial waste in cement plants*** CKD is the dust which passes out of the top of the preheater with the exhaust gases. In principle, the CKD characteristics suggest its suitability to be reused a calcium source in our project. CKD is produced in all cement kilns; however, the quantity produced is dependent on plant-specific operating conditions. In general, the amount of CKD produced for every 100 tons of clinker can be estimated to be about 9 tons.

- *Overall, the data examined indicated that there exists no average* ***Cement kiln dust.*** This highlights the importance of fully characterizing a particular CKD before recommending for its reuse as part of the ECO-CEMENT project. Different samples from different kilns were collected to produce statistically significant results. ***Preliminary experiences*** have evidenced, that the samples analyzed were not suitable as the calcium found was mainly calcite without CaO and Ca $(OH)_2$. However, methods for enhancing the calcium content of the sample were detected to improve its suitability for the process. During the upcoming months, more samples will be collected and analyzed.

If finally, CKD does not fulfill the process requirements we will apply a**lternative sources of calcium outside the cement industry**, such as: lime kiln dust (LKD), whey, etc. The suitability of these wastes will also be investigated following the protocols defined for CKD. The ECO-CEMENT partners keep the research on-going. *The outcomes to be presented in the next number of the "ECO-CEMENT Newsletter" that will be published in November 2013*

ECO-CEMENT Newsletter number 2 will be focused in WP3. WP3 is working on analytical methods to determine the microbial activity and its performance. Based on this analytics, the microbial process will be optimized and upscaled for a suitable and cost-effective calcite production. Due to the dependency on the industry waste selection, WP3 is closely linked with WP2 by the requirements of industrial waste.