

CROME

June
2015

CROSS-MEDITERRANEAN ENVIRONMENT AND HEALTH NETWORK

In this issue:

Welcoming Message

by Prof. Dimosthenis Sarigiannis, CROME-LIFE Coordinator



Greetings!

*Welcome
back to the
third
newsletter of
our project.*

This fourth issue reports progress in developing the CROME-LIFE project after the first year of implementation covering the period from January 2015 to June 2015.

We would like to renew our encouragement to all interested parties to support us in our endeavour and to constructively collaborate in achieving these results for the benefit of society as a whole through an improvement of the health and life quality of the population involved in the project.

We hope that you find this information useful, and we are looking forward to hearing your feedback.

What is CROME?

CROME stands for:

Cross - Mediterranean Environment and Health Network and it is a 42 months demonstration project funded under the EU LIFE+ Programme 2007-2013 started in July 2013.

PROGRESS

Project progress up to date

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Project progress up to date

Action B.3 Targeted measurement campaigns to fill the data gaps

Four national case studies are currently ongoing in four demonstration areas (Greece, Italy, Slovenian and Spain) and a Mediterranean case study (or common case study) which is in progress in the same countries plus Croatia. The CROME Cross-Mediterranean study is a follow up study of pre-existing children Mediterranean cohorts established 1) within the PHIME project, involving Slovenia, Croatia, Italy, Greece and 2) within the INMA Project (Environment and Childhood). Children will be followed up at 6-8 years of age (14 years in some cases in Spain).

In this follow-up study, we aim at finding those genetic polymorphisms that could modulate the detrimental effects of metals, particularly Hg, at low exposure in the Mediterranean cohort.

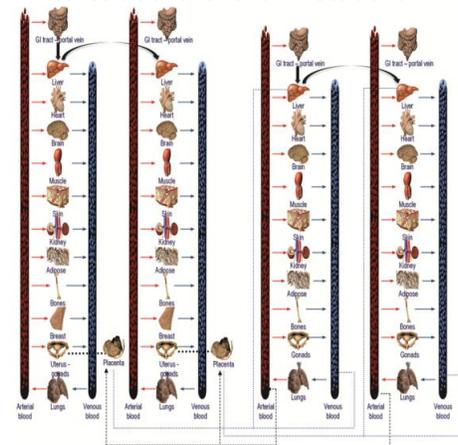
Children were tested for neuropsychological performance using Wechsler Intelligence Scale for Children (WISC III). Moreover, the questionnaires on Socio Economic Status and nutritional habits were re-evaluated.

Samples of environmental matrices (i.e. top soil, surface and groundwater, and ambient air) were collected, stored and analysed with the appropriate analytical techniques, including primarily AAS and ICP-MS (for metals) and GC-MS, HPLC-MS/UPLC-MS (for organic contaminants such as organochlorine compounds and PBDEs).

Some most consumed food items at local areas were also included in the analysis. These analyses will support the derivation of overall exposure

patterns of the local population when analysed in combination with the existing environmental and dietary data found in the databases set. In addition, questionnaire-based surveys of behavioural and dietary habits and time-activity diaries of the local population (the individuals for who HBM data exist in the demonstration sites) will be used to derive complete personal exposure profiles for the study participants.

With regard to **Action B.4** "Exposure assessment" we completed the development of a lifetime generic PBTK model incorporating mixtures interaction. The model main features includes lifespan evolution in physiology, from the moment of conception till 80 years of life-time, taking into account pregnancy (mother-foetus interaction) and lactation periods and interaction of mixtures at the level of metabolism

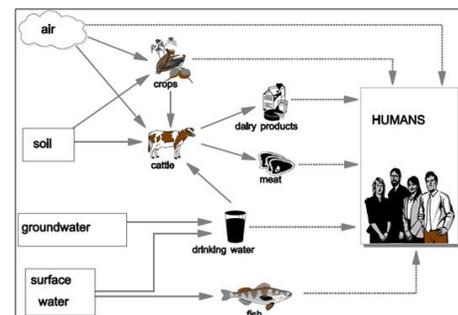


Conceptual representation of the Mother-Fetus PBTK model

We are working on the refinement and on the parameterization of the multi-media fate and transport model for a large variety of chemicals already implemented in the TAGS platform developed by AUTH in the frame of the Cefic LRI program and

based on the SimpleBox/EUSES modeling framework.

Contamination is estimated in several environmental media (air -gaseous pollutants and particles-, water, soil, sediment), nutrition (including migration from food contact materials) and indoor air, including the gas, particle and settled dust phases. Moreover, the dietary contamination module consists of two major elements, namely food chain transfer – coupled to the multimedia model – and migration from food contact materials



Schematic representation of the exposure routes considered in human exposure

Work is ongoing to develop a data assimilation modeling framework to link biomarker data to exposure burden from multiple routes. To this aim a computational framework is currently being developed based on Bayesian Markov Chain Monte Carlo (MCMC) combined with the generic Physiological Based Pharmacokinetic (PBTK) model to estimate the external exposure that is consistent with the measured biomonitoring data.

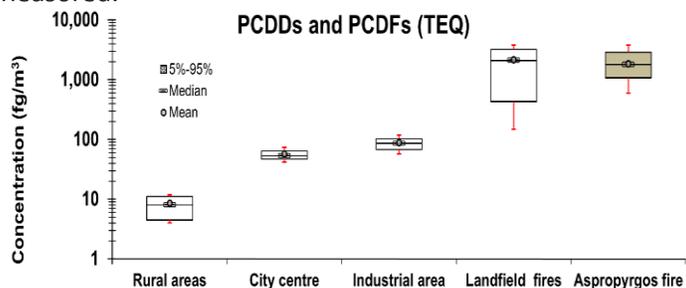
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FOCUS

AUTH applied the whole methodological framework developed in CROME-LIFE to an environmental accident occurred in Greece. On June 6th a material recovery facility located in the area of Aspropirgos near Athens engulfed in flames. The facility, covering an area of approximately 2 hectares used for the separation of recyclables including metals, glass and paper as well as for storage of untreated and baled final products, is located near three Rom community settlements one of which is located in direct contact with the fence of the facility. Furthermore to the west of the facility and 300 meters away the 7th primary school of the Aspropirgos is located.

A sampling campaign was carried out, including both biosamples (blood, hair and urine) of all three Rom people settlement and blood from the school children and their teachers (totally from around 70 people) aiming at assessing the impact that the fire (with regard to dioxins exposure) had on the local population. Food items such as milk, eggs, fruits and vegetables from local farms were also collected to identify impact of the fire on the food chain and ambient air particulates (particles number and size distributed) were also measured.



Levels of PCDDs/PCDFs (TEQ) at various Athens sub-areas, as well as during accidental fire events

Cancer risk of the population due to dioxins exposure was estimated based on previous biomonitoring data of the population and on ambient air concentration levels, utilizing the internal dosimetry methodology developed in CROME-LIFE. According to our results, due to the significant dioxins emissions, lifetime risk is expected to increase by 13.5 %, compared to the risk of dioxins baseline exposure as back-calculated from the previous biomonitoring data.

This outcome was extensively disseminated in press, showing the importance of the CROME-LIFE methodology for addressing risk assessment utilizing multiple type of data (environmental and biomonitoring).

MIDTERM REVIEW MEETING

On April 1, 2015 the CROME-LIFE midterm review meeting was held at AUTH premises in Thessaloniki. The meeting was the opportunity to show and discuss with the project Monitoring Team the current status of the project activities, the plan for the next months and the financial situation. Representatives of all the project beneficiary attended the meeting showing the work done in the Actions they are leading and answering the questions raised by the Monitoring Team so as to provide a fully updated picture of the project outcomes as well as of the current financial state.

In this regard AUTH in collaboration with all the CROME-LIFE beneficiaries completed the final draft of the mid-term report which covers the period from the beginning till the end of March 2015, updating it on the basis of the recommendations provided by the Monitoring Team.

After a final internal review the Project Coordinator submitted the final CROME-LIFE mid-term report on May 19, 2015. It includes the main technical and financial reports and all necessary supporting documentation reported in 25 annexes.



LIFE Project Number
LIFE12 ENV/GR/001040

MIDTERM Report

Covering the project activities from 01/07/2013 to 31/03/2015

Reporting Date

31/03/2015

LIFE+ CROME

Cross-Mediterranean Environment and Health Network

Project Data	
Project location	
Project start date:	01/07/2013
Project end date:	31/12/2016 Extension date:
Total Project duration (in months)	42 months
Total budget	€ 1,760,190
Total eligible budget	€ 1,760,190
EU contribution:	€ 880,095
(%) of total costs	50

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Dissemination events

A number of dissemination and networking activities happened during these 6 months. These included the participation at international conferences, congress and scientific workshops hereinafter summarized:

- **2nd Slovenian toxicological congress in Ljubljana, Slovenia on April 23 and 24, 2015**

where JSI team gave the three following presentations:

Longitudinal epidemiological study of low-level mercury exposure in susceptible population
Essential and non-essential elements at Slovenian population: Results of human biomonitoring
Pilot European Human Biomonitoring study Democophes - case study Slovenia.

- **12th International conference on Mercury as global pollutants (ICMGP 2015) in Jeju, Korea, on June 14-19, 2015**

where JSI team had four oral presentations and one poster as follows:

Evaluation of methyl mercury exposure, susceptibility and health effects in the Mediterranean population.
Assessment of health risks for vulnerable population groups posed by exposure to mercury and its compounds
Environmental and health issues in mercury mining contaminated sites in China and Slovenia
The impact of the intrauterine exposure to MeHg on development of children at age of 18 months
Poster: Human biomonitoring in Slovenia: low-level mercury exposure across the country

- **WHO workshop "Health sector involvement in the implementation of the Minamata Convention: mercury exposure assessment and prevention" at the WHO regional office in Bonn, Germany, on June 23, 2015**

where Dr. J. Snoj Tratnik (JSI) gave two presentations. The first on "Exposure to methyl mercury from fish and other seafood", and the second entitled "Selection of sample matrices and overview of laboratory methods".

- **WHO workshop entitled "Harmonized approach to biomonitoring of human exposure to mercury: International technical experts workshop" the WHO regional office in Bonn, Germany, on June 26, 2015**

where Dr. J. Snoj Tratnik (JSI) gave a presentation entitled "Draft report on selection of sample matrices for human biomonitoring surveys of prenatal exposure to mercury"

- **Workshop "Environmental Pollution, a global problem" in Madrid, Spain, on June 25, 2015**

where CSIC team explained to the Mother Queen of Spain, Ms. Sofia, and a group of 30 accompanying persons the objectives of CROME-LIFE

Networking

On 30 January 2015 JSI participated to a meeting with the Management and Executive Board of the EU funded ERA Chair Isofood project where an effective communication toward a good networking agreement with the ERA Chair Iso-food project stakeholders group was established. We concluded that we shall organize future stakeholders meeting jointly as this could be more cost-efficient and could better attract active participation of stakeholders working in the environment and health community.

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On February 20, 2015, JSI organized a coordination meeting between OIKON Ltd and the Hospital in Rijeka for the inclusion of Croatian PHIME cohort in the CROME-LIFE Mediterranean study

On June 3, 2015 Prof. M. Horvat (JSI) attended the meeting organized by the French Ministry of Research in Paris related to the preparation of the EU JRP Human Biomonitoring Initiative - EHBMI. The EHBMI programme includes strong components of the networking activities such collaboration with on-going environment and health related research projects throughout Europe.

ISS contacted the LIFE+ project PERSUADED "Phthalates and bisphenol A biomonitoring in Italian mother-child pairs" to organize a common initiative with stakeholders in Italy. This networking activities led to the preparation of a brief explanatory note in Italian about the CROME-LIFE activities to be included in the PERSUADED Newsletters.

Stakeholders engagement

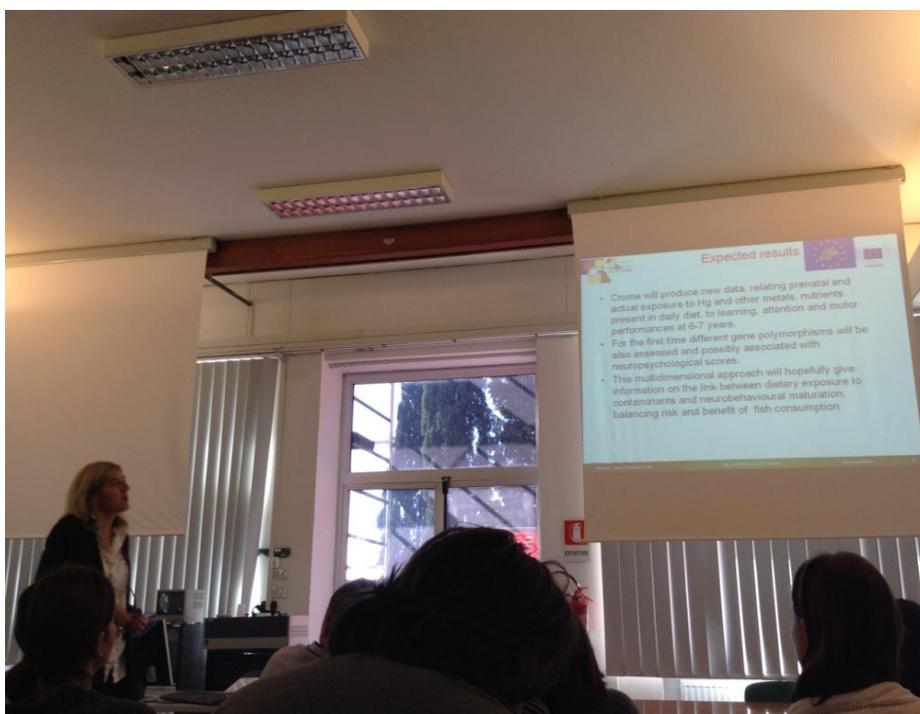
CROME-LIFE consider stakeholders engagement a central theme in the project activities to help guide the project ensuring that it addresses users' needs, and to provide feedback and comments on the utility, shortcomings or potential further development of its products. Hereinafter are reported the major events organized during the period covered by this midterm report aimed at engaging different groups stakeholders in the various demonstration sites.

On 30 January, 2015 JSI participated to a meeting with the Management and Executive Board of the EU funded ERA Chair Isofood project where an effective communication toward a good networking agreement with the ERA Chair Iso-food project stakeholders group was established. We concluded that we shall organize future stakeholders meeting jointly as this could be more cost-efficient and could better attract active participation of stakeholders working in the environment and health community.

On 12 February 2015 CSIC participated to a working meeting in Barcelona with Drs. Maties Torrent (Àrea de Salut de Menorca, IB-SALUT, Fundació Caubet-CIMERA, Mallorca, Spain) and Ferran Ballester (Centre for Public Health Research (CSISP)-FISABIO, Valencia, Spain) to discuss sampling strategies for organochlorine compounds and metals in Menorca and Valencia.

CSIC organized a series of meetings with the health authorities of the Government of the Balearic Islands to coordinate the respective activities of dietary supervision of the routes of intake of mercury and persistent organic pollutants into the population.

On April 24, 2015 a delegation from CSIC visited the City Hall of Flix to meet the major of the village, the councilor for Environment and the manager of a Natural Park in the area. They were informed on how to handle the health risks related with the emission of organic compounds into the atmosphere as consequence of the emissions related with the extraction of residues from a chloralkali plant. The discussion also involved to study the results of the atmospheric measurements performed by personnel from CSIC in this village.



Dr. G. Calamandrei during the stakeholders meeting in Trieste (Italy)

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AUTH had frequent contacts with the Ministry of Health (Directorate of Public Health) to illustrate the field campaign and to set up the biomonitoring study in the area of Asopos river in the course of May 2015 in the frame of the National Case Studies of CROME-LIFE.

JSI organized several working meeting with the Ministry of Health of the Republic of Slovenia, Office for Chemicals and the national Institute of Public Health in order to promote human biomonitoring as tool for risk assessment in the frame of CROME-LIFE activities. As the methodology requires intersectoral approach meetings with the Ministry of Environment, Environmental Agency were also organized to discuss the possibility to better exploit the existing database on air quality.

On June 10 2015, ISS had a technical meeting with stakeholders in Trieste (Italy) at Burlo Garofolo Pediatric Institute to discuss the data stratification and association of follow-up data with previous neuropsychological scores assessed at 18 and 40 months of age.

Press cuttings overview

Prof. M. Horvat (JSI) released a TV interview: Moj pogled na znanost (i.e. my view of science) presented on the main Slovenian TV channel RTV 1 on 11 and 17 January, 2015. The importance of HBM was emphasized and the need for an integrated approach as the one developed in CROME-LIFE to assess the safe consumption of fish in the Mediterranean population was highlighted.



Prof. M. Horvat during the interview on a Slovenian TV channel

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Publications

CSIC has published three scientific papers. The first one entitled *Food sources of arsenic in pregnant Mediterranean women with high urine concentrations of this metalloid*, *Environmental Science and Pollution Research* 21, 11689-11698 (2014), the second entitled *Temporal trends in concentrations and total serum burdens of organochlorine compounds from birth until adolescence and the role of breastfeeding*, *Environment International* 74, 144-151 (2015) and the third entitled *Interdependence between urinary cobalt concentrations and hemoglobin levels in pregnant women*, *Environmental Research* 136, 148-154 (2015)

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Health impact and monetary cost of exposure to particulate matter emitted from biomass burning in large cities

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HIGHLIGHTS

- Health and monetary impact assessment of exposure to PM from biomass burning.
- 200 excess deaths annually (for a 900,000 population) are expected in the cold season.
- The respective monetary cost ranges from 200M€ to 1.2B€.
- Monetary cost of health burden compounds the fiscal burden of austerity measures.

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ABSTRACT

The study deals with the assessment of health impact and the respective economic cost attributed to particulate matter (PM) emitted into the atmosphere from biomass burning for space heating, focusing on the differences between the warm and cold seasons in 2011–2012 and 2012–2013 in Thessaloniki (Greece). Health impact was assessed based on estimated exposure levels and the use of established WHO concentration–response functions (CRFs) for all-cause mortality, infant mortality, new chronic bronchitis cases, respiratory and cardiac hospital admissions. Monetary cost was based on the valuation of the willingness-to-pay/accept (WTP/WTA), to avoid or compensate for the loss of welfare associated with illness.

Results showed that long term mortality during the 2012–2013 winter increased by 200 excess deaths in a city of almost 900,000 inhabitants or 3540 years of life lost, corresponding to an economic cost of almost 200–250M€. New chronic bronchitis cases dominate morbidity estimates: 490 additional new cases corresponding to a monetary cost of 30M€. Estimated health and monetary impacts are more severe during the cold season, despite its smaller duration (4 months). Considering that the increased ambient air concentrations (and the integral of outdoor/indoor exposure) are explained by shifting from oil to biomass for domestic heating purposes, several alternative scenarios were evaluated. Policy scenario analysis revealed that significant public health and monetary benefits (up to 2B€ in avoided mortality and 130M€ in avoided illness) might be obtained by limiting the biomass share in the domestic heat energy mix. Fiscal policy affecting fuels/technologies used for domestic heating needs to be reconsidered urgently, since the net tax loss from avoided oil taxation due to reduced consumption was further compounded by the public health cost of increased mid-term morbidity and mortality.

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1. Introduction

Indoor biomass burning for residential heating is a major source of indoor and outdoor air quality degradation. One of the major components of biomass burning is emitted PM. The association of biomass burning PM with potential health effects, as well as their toxicity potency in comparison to other PM combustion sources have been investigated through a controlled study of human exposure to wood smoke, epidemiological studies (observational or interventional), as well as with toxicological tests – a very comprehensive review on both perspectives was carried out by Naeher et al. (2007).

To date, solely a single controlled study of human exposure to wood smoke has been published (Barregard et al., 2006). Inflammatory mediators and coagulation factor levels of the exposed subjects were altered and free radical-mediated lipid peroxidation increased after wood smoke exposure. Although this is the only controlled study of wood smoke exposure published to date including a small number of subjects (13), it is suggestive of wood smoke-associated systemic inflammatory effects.

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Temporal trends in concentrations and total serum burdens of organochlorine compounds from birth until adolescence and the role of breastfeeding

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 Organochlorine compounds
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 Hexachlorocyclopentadiene
 Polychlorobiphenyls

ABSTRACT

Introduction: The aims of the present study are to assess the temporal trends of organochlorine compounds (OCs) concentrations and total serum burdens from birth until adolescence and the influence of breastfeeding in these temporal trends. **Methods:** In 1997 two birth cohort studies were set up in Ribera d'Ebre (N = 102) and the island of Menorca (N = 492), Spain. Concentrations (ng mL⁻¹) of OCs [pentachlorobenzene (PeCB), four isomers of hexachlorocyclopentadiene (HCH), hexachlorobenzene (HCB), dichlorodiphenyldichloroethane (4,4'-DDE), dichlorodiphenyldichloroethylene (4,4'-DDE) and seven polychlorobiphenyl congeners (Σ-PCBs)] were measured in cord blood and at the age of 4 and 14 years. The total serum burdens (ng) of these compounds were estimated based on the total blood volume (mL) of children at the different ages. We compared median concentrations and total serum burdens of these OCs at the different time-points of follow-up between children of Ribera d'Ebre and Menorca and between breastfed and non-breastfed children. **Results:** From birth until adolescence concentrations of all OCs drastically reduced. These reductions were mainly derived from the dilution of OCs, associated to an increase in total blood volume of children at the age of 4 and 14 years. Despite the reduction in OCs concentrations, the total serum burdens of 4,4'-DDE and Σ-PCBs, were higher in adolescents than at birth. Increases in OCs total serum burden occurred both in breastfed and non-breastfed children, but were significantly higher in the first. **Conclusions:** Even after decades of banning OCs production and use, current young generations in westernized countries are still bioaccumulating these compounds. Given the potential health effects of OCs, special attention should be paid in the control of secondary emissions in the environment and in the control of food production and contamination. In countries with endemic malaria it is important to work towards effective alternatives to the use of DDT.

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1. Introduction

Organochlorine compounds (OCs) include a wide range of chemicals, such as polychlorobiphenyls (PCBs), dioxins, dichlorodiphenyldichloroethylene (DDE) or hexachlorobenzene (HCB). They are lipophilic synthetic chemicals and belong to the family of persistent organic pollutants (POPs) because they persist in the environment for years and bioaccumulate through the food chain in human and animal fatty tissues (Carpenter, 2011). Through the placenta, humans start being exposed to OCs during prenatal life. After birth, in the first months or years of life, mothers can transfer a certain amount of these compounds through breastfeeding because of the lipophilic properties of POPs

^{*} Abstracts: 4,4'-DDE, dichlorodiphenyldichloroethane; 4,4'-DDT, dichlorodiphenyldichloroethane; HCB, hexachlorobenzene; HCH, hexachlorocyclopentadiene; OCs, organochlorine compounds; PeCB, pentachlorobenzene; PCBs, polychlorobiphenyls; PCBs, persistent organic pollutants.

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AUTH published a scientific paper entitled *Health impact and monetary cost of exposure to particulate matter emitted from biomass burning in large cities*, *Science of the Total Environment* 524-525 (2015) 319-330.

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CROME-Life website is online

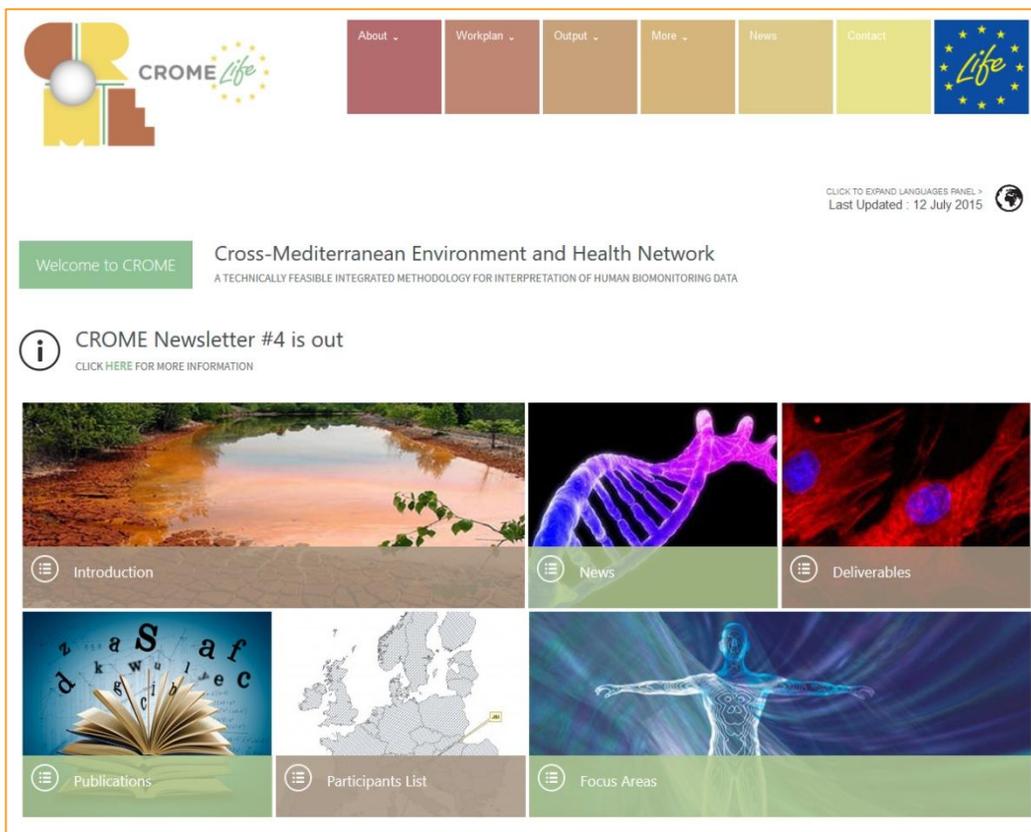
Visit our project website at www.crome-life.eu.

On the website you can find information about

- the structure of the project,
- methods,
- workplan and
- links to the partners.

There is also a section with products such as

- deliverables,
- published papers,
- presentations and
- an area where announcements of key scientific events (e.g. workshops, conferences) are reported.



The web site is continuously being updated with the latest news and deliverables. If you have any documents you would like to be added on the CROME-LIFE website, please let us know.

CROME Newsletter4

NEXT ISSUE:

The next issue will feature other news and documents developed by the CROME–LIFE Consortium covering the period from **July 1, 2015 - to December 31, 2015**

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