Progress Report

October/November 2021

As reported in the previous news, due to Covid-19 there will be bi-monthly news until further notice. Any news up-dates will be implemented as and when necessary, during October and November 2021.

Cyber Space Projects

The new Cyber Space project will deliver an encrypted traffic analysis service platform for cyber security. The platform will support a number of basic building blocks necessary for any Machine Learning (ML) and Deep Learning (DL) based traffic analysis. C4FF is pleased to be involved in this interesting and innovative project and disseminate and exploit the project outcomes through its networks in UK and across Europe.

C4FF has been involved in several EUREKA projects and currently support two ITEA3 projects.

The new research project is called ENTA which will commence shortly. C4FF will use the findings of this project to support its local Cyber Space project to ensure small companies in its locality can also benefit from this outcome of ENTA research work. ETNA has already been approved and Cyber Space is also expected to be approved by the UK Government soon.

In support of its efforts in countering cyber espionage and attacks, the Centre for Factories of the Future (C4FF) has developed a full degree programme and various modules have already been tested at associated universities including C4FF's own university, namely, University Centre Garden City (UCGC). Furthermore, C4FF has started a new project named Cyber Space to help mainly very small businesses to cope with complexity of computer systems and networks and become cyber security safe.

C4FF is an RTD capacity based in Coventry and Kenilworth (UK). C4FF is the instigator of the Factories of the Future projects in the UK and supported similar developments in the EU. Since the company was founded in 1996, C4FF has gained extensive experience in participating and co-ordinating EU and UK funded R&TD projects in areas such as: Artificial Intelligence Systems, Cyber Security, Sales Forecasting, Market Intelligence Knowledge Extraction, Innovation Management, Factory Automation and Enterprise Resource Planning. C4FF has several ICT, manufacturing facilities and laboratories worldwide. These laboratories are equipped with the most up-to-date facilities. We also have access to several laboratories in several partner institutions. C4FF has an established reputation for developing novel manufacturing systems and software for factory management, including for lean practices. We also have many years of experience in ICT and Manufacturing research and development, as well as cyber security. Cyber Security is of particular interest to C4FF Maritime Division supporting the shipping industry against cyber-attacks.

Life Skills VR – a new EU/UK funded Project

VR Innovation Project - Life Skills for Employment in COVID-19 Era through VR Innovation Project
Another Revolutionary Idea from C4FF

Although this project proposal is about Life skills development helping young and old find worthwhile jobs, VR offers a range of solutions in several other areas.

Our proposed project aims to solve the problem of giving the youth the necessary skills and knowledge of what their skills and abilities are and in which occupation they can excel in and have a bright future. By approaching the issue at the earliest stage, the aim is to prepare the young and to reduce stress and future dissatisfaction and provide a glance of future opportunities. The users will be able to recognise missing skills and thus focus on the important aspects by themselves and therefore will be able to eliminate skills mismatching and develop key skills. Also, by knowing their strong points the Generation C will be able to develop themselves to higher levels in seeking and retaining good and well-paid jobs.

The VR proposed solution will have many more applications providing 3D visualisation of technical or non-technical information for learning new situations, acquiring new skills or simply helping us to navigate a new location or perform our jobs better. It can be used as a ship or boat simulator or navigation system. The proposed system can also capture information for analysis later and so forth. The combination of smart phones and VR technology can revolutionise the way we live and learn. What about using the VR devices for detecting dangers on our path for those with visual impairment or having access to information at meetings?

The project could support some of the work initiated by C4FF to help design new AI software to develop new VR applications. With C4FF's track record of developing novel AI solutions there is an expectation that a number of disruptive products and services will be introduced in the application of computer technology in our daily jobs and lives.

There have been several developments since the last News in April/May 2021. The new university building has been delayed due to Covid but it is expected that new laboratories will be commissioned within the new building once completed. The air quality centre, STEM Centre and Cyber Centre are expected to be housed in the new university building. C4FF has an unrivalled track record of success with all its past and present funded projects, many awarded as ‘Best in Europe’ and all scoring high for the proposal and on project delivery.

Life Skills VR Project Soft Launch on 14th of May 2021

Corona virus

The problems associated with Corona Virus continue to have an impact on C4FF's work including its charitable networks and business units. Some of the EU and Eureka projects are progressing in general but some EU funded projects are being either re-scheduled or extended. This situation if continued may impact other projects and activities. We hope these surreal times will come to an end and that we can continue to work on all projects as planned soon. The manning for the existing and new projects has been agreed.

Key Announcements

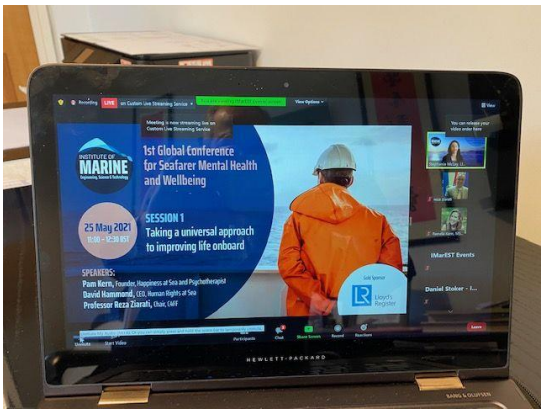
As reported in the last month News, C4FF's University Centre (Garden City) supported the development of two new courses in Technological Innovations and Research Methods. The courses were submitted to the Institution of Marine Engineering, Science and Technology (IMarEST). Both courses have now received recognition as IMarEST CPD courses. C4FF is also in the process of finalizing the development of an e-course in mentoring. With support from IMarEST the course is now being evaluated and is expected to be submitted as a recognized CPD course in the near future. In parallel, a course in improving mental health at sea and eradicating bullying is being developed with several partner organisations in the EU.

New CPD Courses or C4FF

2021 Year of Seafarers Mental Health and Wellbeing

MariFuture continues with the publication of a Development Paper on its key projects which this year is efficient ship and Seafarers mental well-being. The papers will focus on the toxic pollutants from shipping and coping with mental stress at sea particularly due to Covid.

In support of this initiative C4FF with support from PROMETHEAS project partners prepared a presentation at the IMarEST's Global Conference for Seafarer Mental Health and Wellbeing. The title of C4FF presentation was PROMETHEAS Project - Mental Health Data Research Hub for Seafarers. The presentation was the first paper presented on the first day of the conference which was held on Tuesday, 25th May. More information about this even and for registration please see 1st Global Conference for Seafarer Mental Health and Wellbeing.



PROMETHEAS Workshop 25th May 2021

The Prometheas Partners also prepared and presented a paper at TranNav 2021, a major event in Poland. More information about this conference can be found at the conference website - https://transnav2021.umg.edu.pl/. The title of the paper is 'Tools for supporting mental health surveillance of sea workers'. C4FF is a co-author of this paper. Another paper is being prepared for presentation at International Association of Maritime Universities (IAMU); more on this at the next News.

The partners of GreenShip are preparing a paper for presentation at IAMU. Details of this paper will be publicised in the next news.

Funded Projects

PROMETHEUS - This proposal was accepted in mid- August 2019 and concerns the mental well-being of ship crew. The project started in November 2019. The first meeting of the partners was on the 18-19 November 2019 in Athens. The partners have meet on regularly and next meeting is planned for 17th September 2021 at 11:00 CET. Partners have also prepared the first Interim Report and this together with all the necessary documents inlcuding the timesheets were sent to Polish NA. The feedback from the Polish NA has been positive.

PROMETHEAS Project team from Poland, UK, Greece, Finland, Spain and Slovenia

C4FF produced the first draft of the two proposed chapters of the Prometheas course and prepared a Learning and Assessment strategy for the Course. Several quizzes were prepared for the partners' considerations. The partners as agreed produced more content and quizzes. Partner for Greece has produced the first draft of the Chapter on Bullying to complement the existing worked carried out by C4Ff supported by all partners.

Regarding other dissemination activities C4FF attended the **Nautical Institute's Seafarers' Mental Health – Turning Talk into Action webinar**, on 8th June 2021. An interesting workshop seeking practical solution to the mental health issues often faced by seafarers and particularly heightened by Covid pandemic. Professor Ziarati asserted that recent studies show that Fatigue to be by far the greatest factor affecting seafarers mental wellbeing and that the only organisation than can help and an immediate response is IMO. Unfortunately IMO has been very slow as it is composed of national administrations who in turn often take the interest of their shipping industry into consideration. As ship companies have been facing economic uncertainties they are not in a position to agree to changes that could cost them more particularly at these surreal times of Covid era. Shipping companies are all without exception under severe commercial pressure and some have been facing insolvency problems.

It was also stated that national administrations in the West are often progressive and try to address their seafarers' problems head on while the story could be very different in other parts of the world. This is an area where IMO can help by imposing some rules to protect seafarers' basic rights.

Formation of Special Interest Group (SIG) for Seafarers Mental Health

As reported in the previous News, C4FF have been involved in helping to set up a mental health group with LR, IMarEST, HSE, MCA, MaritimeUK, ISWAN and several others to find ways to share knowledge and experiences in mental health topic areas. The group is keen to organise workshops/conferences and seek support in setting up a formal SIG in this connection. The first workshop was organised by MaritimeUK on Mental Health on 2nd March 2021. C4FF attended this workshop and made contributions to it reporting on Prometheas findings so far.

Prior to the MaritimeUK C4FF together with IMarEST become involved in a discussion to set up first a UK Special Interest Group (SIG) to promote a series of action to help improve mental health and wellbeing at sea. The SIG was formed in February 2021 and since then had several meetings the last meeting took place on 13th April 2021. The discussions at these meetings have led IMarEST on behalf of SIG to organise a major conference titled: 1st Global Conference for Seafarers Mental Health and Wellbeing on 25-26 May 2021. The outcome of this conference is expected to lead to plan for future collaborations and preparation of several proposals.

The last meeting of partners was held on 21 may 2021 and the next is scheduled for 18th June 2021.

Bi-weekly meeting of Maritime SIG 8 June 2021

Current SIG members:

Professor Reza Ziarati – PROMETHEAS; Centre for Factories of the Future
Stephanie McLay – LR
Richard Graham – IMarEST
Daniel Stoker – IMarEST
Panos Stavrakakis - HSE
Olivia Swift – LRF
Steven Jones – Happiness Index founder
Pav Hart- Premkumar – MCA
Melanie White – UK Chamber of Shipping
Chrissie Clarke – Maritime UK
Ben Gibbons – Maritime Charities Group (MCG)
Ben Bailey – Mission to Seafarers
Caitlin Vaughan – LRF
Luca Tommasi - ITF Seafarers' Trust
Cerian Mellor - Shell
Hazel Lewis – MCA
Sandra Welch – Seafarers Hospital Society
Chirag Bahri – ISWAN

Kishore Rajvanshy – Fleet Management Ltd.
Joanne Stokes – LR
Volkan Arslan – LR

PROMETHEAS UK Workshop

25th July 2021 - 10:00-12:30

This workshop was initiated by a newly formed special interest group on mental health and wellbeing in the UK and organised co-jointly by C4FF and IMarEST to encourage a practical approach to improving seafarer mental health and wellbeing and disseminate the work of PROMETHEAS project.

Attendee list:

There were a total of 75 attendees from the following organisations:

HA Group
Southampton University
Marine Accident Investigation Branch
HSE
Lloyd's Register
Maritime UK
Maritime and Coastguard Agency
Burgess Yachts
Fugro
Sea Wellbeing
Lloyd's Register Foundation
C4FF
World Maritime University
Stella Maris
Practical Psychology Consultancy
Keil Centre
Sailors Society
The Seafarers Charity
Shell
Human Rights at Sea
UK Chamber of Shipping
Maritime Executive
Kings College London
ISWAN
Nordic Medical
Scoutbase
Standard Club
Southampton Solent University
Seaways Psychology

MNWB
Well at Sea
ISWAN
Rhine-Waal University of Applied Sciences
MTM Agency
Elvictor
Atlantictowing
Liverpool Museums

Due to data protection act the names could not be published.

The workshop was the first part of the 1st Global Conference for Seafarer Mental Health and Wellbeing which brought together global leaders and key stakeholders from the maritime sector who are actively involved and have a keen interest in discussing practical solutions to improving seafarer mental health and wellbeing. The focus was on interventions and exploring best practice of implementation, monitoring results and identifying what more can be done.

The workshop was sponsored by IMarEST, Lloyd's Register, MaritimeUK and several other maritime organisations in the UK. For all sponsors see Event website: https://www.imarest.org/mentalhealth.

Workshop/Conference Committee:

Co-Chair: Capt Panos Stavrakakis PhD CEng FIMarEST, Champion of IMarEST Mental Health & Wellbeing Initiative and Head of Centre of Organizational Health & Wellbeing, Health & Safety Executive
Co-Chair: Stephanie McLay MSc MBPsS, Senior Human Factors Consultant, Lloyd's Register
Chrissie Clarke, Programme Manager Diversity and Skills, Maritime UK
Hazel Lewis, Seafarer Safety and Human Element Policy Manager, Maritime and Coastguard Agency
Pav Hart-Premkumar, Human Element Policy Specialist, Maritime & Coastguard Agency
Richard Graham CEng CMarEng FIMarEST, Chair of IMarEST Professional Affairs & Education Committee

The C4FF/IMarEST were keen to hear about experiences from all perspectives: Senior leadership, ship owners/operators, flag states, port states, charterers, manning agents, unions, training providers, academia, associations, and regulators.

The PROMETHEAS Project was presented by Professor Dr Reza Ziarati, C4FF, PROMETHEAS Project coordinator in the UK, followed by presentations on several mental health and bulling key topics:
- Raising awareness, overcoming stigma, and understanding the effects of working at sea
- Safety culture and how this can be used to promote positive change
- Workers' rights and violations
- What lessons can we learn from other industries?
- What policies and practices have been/could be implemented and their effectiveness to support seafarers' mental health and wellbeing?

- What challenges do smaller crews/companies face?
- What does a healthy working environment look like? How can we create a healthy working environment? What benefits a healthy working environment brings to the industry?

The conference took place online using the IMarEST's online conference platform, with speakers and delegates able to attend, and network with each other, from anywhere in the world.

Key features include:

- Flexible 2-day conference programme of 90-minute live sessions.
- Dedicated networking sessions where you can explore your views on presentations.
- Exclusive on demand access to sessions via IMarEST TV for 6 months after the conference.
- Virtual exhibition area to connect with sponsors and supporting organisations.
- Easy access to the conference platform via your computer and/or mobile devices.
- IMarEST CPD-recognised Certificate of Attendance following the conference

For further information please contact Professor Reza Ziarati at reza.ziarati@c4ff.co.uk

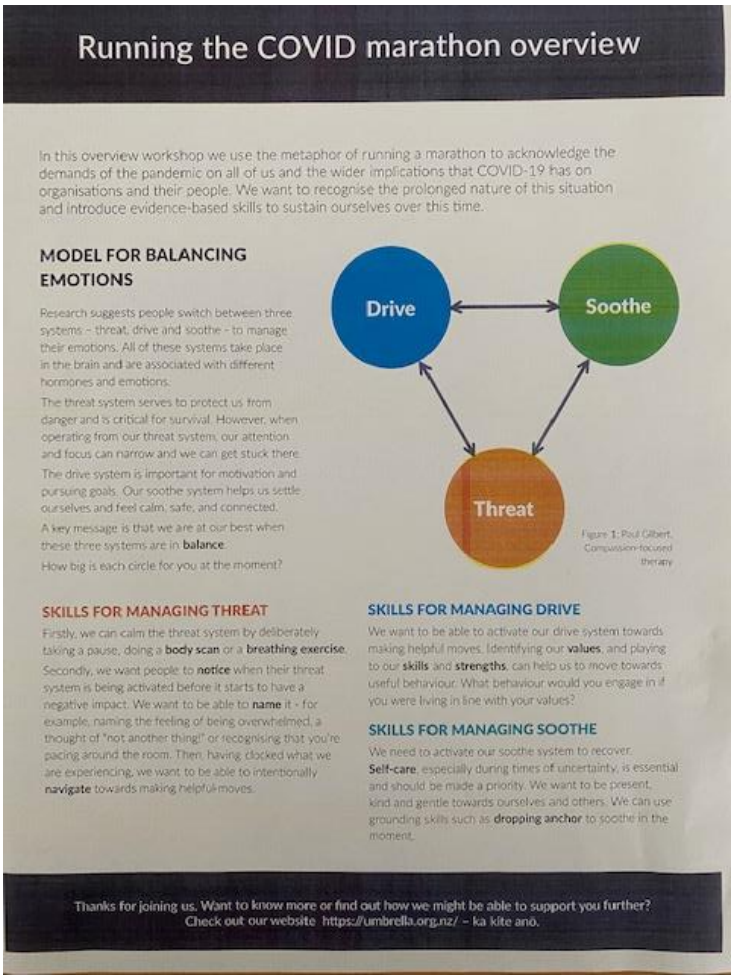
C4FF has had provisional agreement from its SIG to run another workshop in March/April?may 2021. Initial preparation has already began.

Outcome of PROMETHEASs Multiplier Event in Finland

As reported the two-day multiplier event run in Finland by Prometheas project partners was successful. C4FF and partners have had several meetings to discuss outcome of Multiplier event and review the plan for the implementation of the project. The E-course being developed by support by all partners led by C4FF is progressing well. Several workshops were arranged or participated by C4FF in support of Prometheas project. The following are summary of some:

The Institution of Mechanical Engineering (IMechE) Wellbeing Initiative workshop

The Institution of Mechanical Engineering wellbeing initiative workshop delivered by Dr Dougal Sutherland on 16th December 2020 describing a model for self care by focusing on Threat paused, Drive (helpful moves/actions) and Soothe (values, skills and strength that help). A short description of the model is presented below:



Running the COVID marathon overview

In this overview workshop we use the metaphor of running a marathon to acknowledge the demands of the pandemic on all of us and the wider implications that COVID-19 has on organisations and their people. We want to recognise the prolonged nature of this situation and introduce evidence-based skills to sustain ourselves over this time.

MODEL FOR BALANCING EMOTIONS

Research suggests people switch between three systems – threat, drive and soothe – to manage their emotions. All of these systems take place in the brain and are associated with different hormones and emotions.

The threat system serves to protect us from danger and is critical for survival. However, when operating from our threat system, our attention and focus can narrow and we can get stuck there.

The drive system is important for motivation and pursuing goals. Our soothe system helps us settle ourselves and feel calm, safe, and connected.

A key message is that we are at our best when these three systems are in **balance**.

How big is each circle for you at the moment?

Figure 1: Paul Gilbert, Compassion-focused therapy

SKILLS FOR MANAGING THREAT

Firstly, we can calm the threat system by deliberately taking a pause, doing a **body scan** or a **breathing exercise**.

Secondly, we want people to **notice** when their threat system is being activated before it starts to have a negative impact. We want to be able to **name** it - for example, naming the feeling of being overwhelmed, a thought of "not another thing!" or recognising that you're pacing around the room. Then, having clocked what we are experiencing, we want to be able to intentionally **navigate** towards making helpful moves.

SKILLS FOR MANAGING DRIVE

We want to be able to activate our drive system towards making helpful moves. Identifying our **values**, and playing to our **skills** and **strengths**, can help us to move towards useful behaviour. What behaviour would you engage in if you were living in line with your values?

SKILLS FOR MANAGING SOOTHE

We need to activate our soothe system to recover. **Self-care**, especially during times of uncertainty, is essential and should be made a priority. We want to be present, kind and gentle towards ourselves and others. We can use grounding skills such as **dropping anchor** to soothe in the moment.

Thanks for joining us. Want to know more or find out how we might be able to support you further? Check out our website https://umbrella.org.nz/ – ka kite anō.

IMechE Mental Health and Well-being

The Chair of C4FF is also the Chair of the IMechE for the Midlands Region and as a follow on from the above helped to arrange a workshop on Mental Health and Wellbeing on 5th January 2021. As well as the discussion on PROMETHEAS (not a spelling error of PROMETHEUS) project and its findings so far, a new concept was introduced by IMechE New Zealand on key drivers of stress and how we manage it from a neurological point of view. The concept derives from the Model of Balancing Emotions developed by Paul Gilbert (2020) as per workshop on 16th December 2020. His research has found that people switch between three systems – Threat, Drive and Soothe. The concept proposes Skills for Managing Threat, Skills for Managing Drive and Skills for Managing Soothe. More on this at the next meeting of PROMETHEAS, Friday 20th February 2021.

GreenShip

Progress Report

This an Erasmus+ project started in October 2019 when the details were published in MariFuture. The kick-off meeting took place in Barcelona on 9-11 December 2019.

GreenShip Project Team from Spain, UK, Finland, Italy, Greece and Slovenia

The second partner meeting for Greenship was in the UK on the 27th and 28th February 2020. This second Greenship Partner Meeting combined a Multiplier Event with IMechE lectures and visit to the Battery production at Warwick Manufacturing Group and a keynote lecture by Professor Ziarati followed up by short presentation by the Partners and guest speakers at Warwick University. The lectures and battery production visit went well.

Figure 1 and 2 (above) is at Warwick University Lecture Theatre with Professor Ziarati and Captain Heikki.

Figure 3 and 4 is of the Lecture Theatre at Warwick University showing Professor German presenting

Figure 5 and 6 (above) is of the partner meetings based at C4FF, Berkeley House

The Satakunta University of Applied Sciences (SAMK) has organised an online event on Towards Zero Emissions on Thursday 29 October 2020 at 10.00–13.00. For more information click here

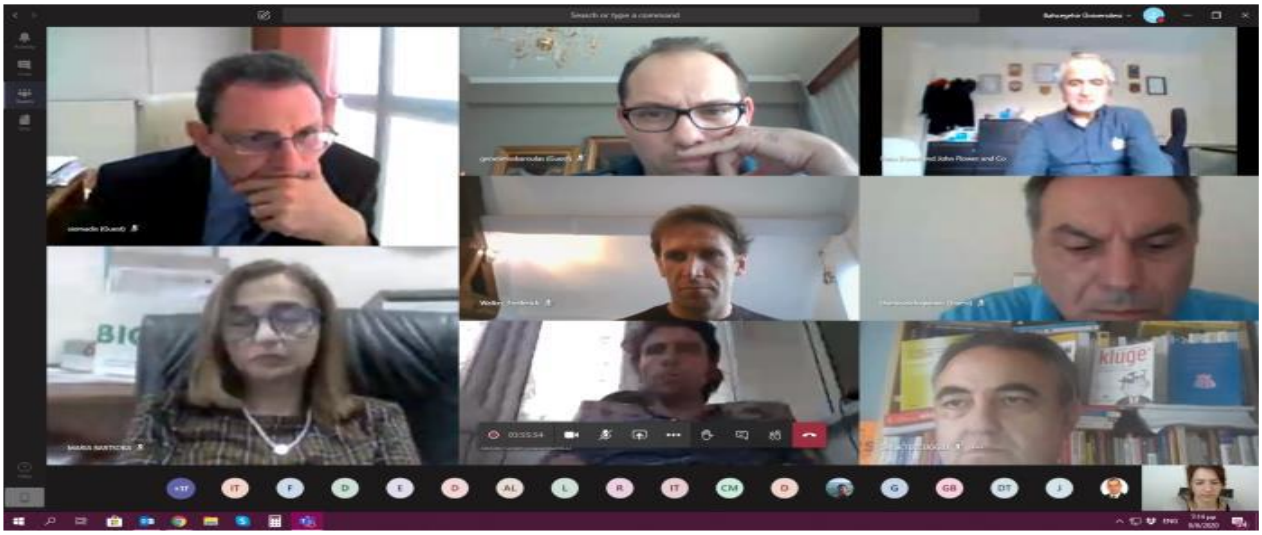
The GreenShip project is progressing as planned but the third partner meeting in Barcelona had to be cancelled due to the Corona Virus. A meeting was arranged on 25th June 2020 to report on the initial work carried out regarding IO 5 followed by IO 6. The postponed second Multiplier

meeting which was planned for April 2020 delayed several times to see if a face-to-face event is feasible but due to continued Covid restriction eventually was decided to have it virtually in October 2020.

Since the Multiplier event in the UK partners have met on regular basis virtually and the last meeting took place on 22nd of July 2021 at 10:00 CET.

Mentor Project

The #Mentor4WBL@EU Project was designed after the European Council prompted the EU Member States to increase "substantially the number of apprenticeships and traineeships to ensure that they represent real opportunities for young people, in cooperation with social partners and where possible integrated into education programmes". In addition, according to the newly adopted "European Framework for Quality and Effective Apprenticeships" (October 2017), European Commission identifies 14 key criteria that Member States and stakeholders should use to develop quality and effective apprenticeships. Among the specific criteria, is made a concrete reference on the necessity to exist a specific procedure for teachers, trainers and in company mentors to "update their skills and competences in order to train apprentices according to the latest teaching and training methods and labour market needs". In-company WBL mentors are in the core of quality WBL. However, in most European countries, they lack standardized support and guidance which will set the expectations and boundaries clarifying and ensuring their successful contribution in the learning process. Based on the above and the identification of the WBL needs and gaps by NetWBL, there is a significant need for the development of standards and qualifications that would identify certain knowledge, skills and competences. They should also provide adequate assessment that will lead to valid certification and August 2019 marifuture.org News ensure quality in-company WBL mentorship in enterprises providing apprenticeships and internships. More information about the project will be available on the project website when it is published.



A snapshot of the virtual Mentor Multiplier Event organised by the Project Lead on 18th January 2021

Since the virtual multiplier event there have been several virtual partner meetings as well as several meetings with specific partners involved in IO 5. The IO 5 is now concluded and work on IO 6 is continuing.

There were regular meetings of partners working on various IOs and as reported earlier the final conference and partner meeting took place online on 18th January 2021. The last few weeks the focus of the project has been on preparing an IPR and business model. The final conference of Mentor Project took place on 18th January 2021. The conference programme was as follows:

Mentor4WBL@EU

On-line Final Conference

Monday 18/02/2021, 16:00p.m -18:00 p.m.(Central Europe Time)

16:00-16:15 Welcome Speech & Presentation of #Mentor4WBL@EU project by Mr Vassilis Siomadis, Project Manager

16:15-16:30 Presentation of the Course & Syllabus design for apprenticeship and internship in-company WBL mentors (IO1 & IO2) by Ms Jennie kallergi, DIEK AIGALEO

16:30-16:40 Presentation of Certification scheme for workplace mentors (IO3) by Mr Didier Blanc, EFCoCert

16:40 – 16:50 Presentation of the Assessment Development for apprenticeship and internship in-company WBL mentors (IO4) by Professor Reza Ziarati, C4FF

16:50 – 17:00 Presentation of the E-Course Development for apprenticeship and internship in-company WBL mentors (IO5) by Professor Yaman Omer ERZURUMLU, BAHCESEHIR UNIVERSITY

17:00-17:15 Presentation of the IT competence certification platform and the results of the pilot test phase (IO6 & I07) by Ms Florence Le Lann, Viasyst

17:15-17:30 Presentation of the Exploitation Report by Ms Maria Bartsoka, Head of Unit, IVET Directorate, OAED

17:30-17:50 Q&A

17:50-18:00 Conclusions & Closure

Moderator: Vassilis Siomadis

Official Language of the Event: English

Est. 2006 IME GSEVEE Small Enterprises Institute of GSEVEE

Co-funded by the Erasmus+ Programme of the European Union

The Partners also had a meeting to prepare for the Conference and also a meeting after to discuss post-funding issues.

As a result of the final conference partners helped in finalising the final report and submitted it the Greek NA on 13th April 2021. Once the final assessment is carried out C4FF intends to promote the e-course in Mentorship throughout its network in the UK and later through MariFuture.

Final report of Mentor Project was submitted to the Greek NA at the end of March 2021.

PoliUniBus

The project is progressing well. Partners are having Monthly online meetings to discuss project progress. The partner had a meeting on 16th of August 2021.

IO3 Development of Models for Engagement update

The partners led by UoL have started working on IO3 - which will produce a practical model of engagement that can be initiated by universities and/or industry in response to thematic challenges. This work includes the development of a workbook for business-academia collaboration to implement responses to characterise challenge attributes expected in PoliUniBus. Final version of Engagement model was expected to be ready by M24 but due to COVID-19 is planned for conclusion in M30.

IO4 - Challenge-led Grading Framework

U.Porto team with support from all partners has started preparing Challenge-led Grading Framework that provides guidelines on how the HEI assess and give credit to students' work carried out on the platform and how will companies assess what is a good idea/solution and communicate this to the respective HEIs/students.

The final version of the Grading Framework was expected to be ready by M24 but due to COVID-19 is now planned for conclusion in M30.

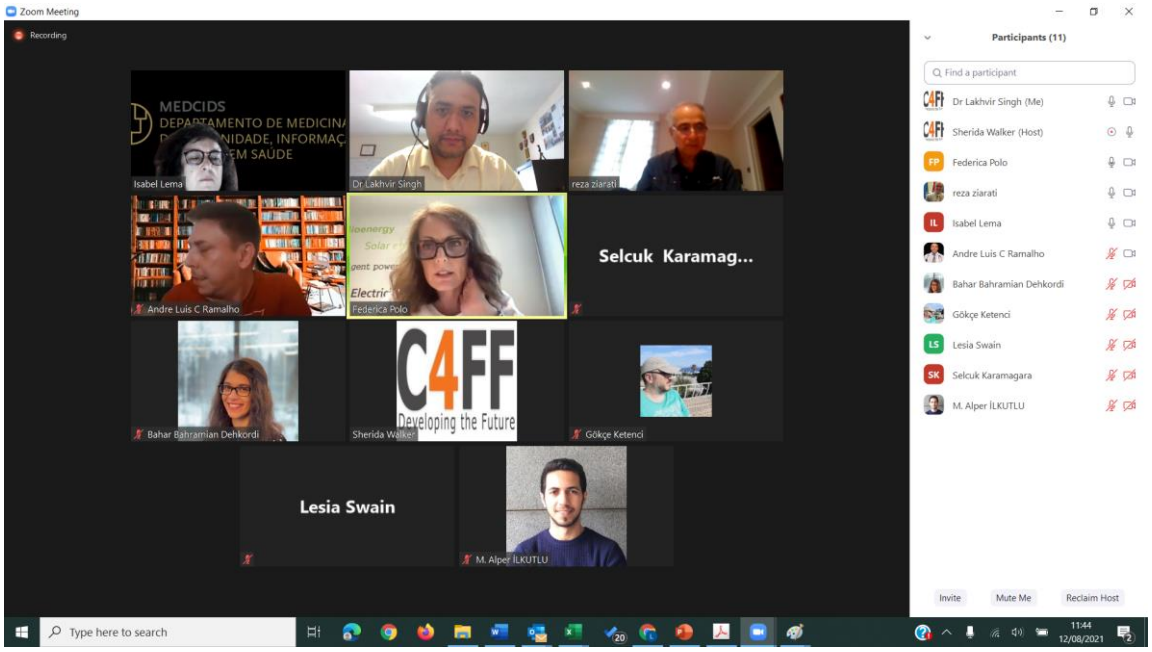
IO5 - Expansion of Cloud platform

In parallel, the technology partners led by C4FF have been working on the PoliUniBus cloud platform. The platform architecture has been developed that provides horizontal services (knowledge search engine, data persistence, etc) and vertical services (collaboration project management: service to support definition of project challenges by companies, to help selection of challenges by HEIs, to support the search of finance etc). The architecture of the cloud platform has been developed so that it takes advantage of a Service-Oriented Modelling Framework (SOMF).

The result of this activity will be included as part of the design documentation and will be presented in the final report.

The next international meetings will take place in UK between 21th and 22nd of October 2021.

Project Website: https://www.poliunibus.org/



Online Project Partner meeting with partners from United Kingdom, Finalnd, Turkey and Portugal

DayTiME Project

The project is progressing well. The partners are having periodic online meetings.

During last semester, C4FF team worked on DayTiMe Standardisation activities i.e., reviewing existing standards in Digital Twin and predictive maintenance domain. C4FF team participated in number of online discussions during virtual meetings with partners as well as several internal meetings. C4FF played an active role in project dissemination through MariFuture platform by publishing monthly generic project progress reports.

For more information visit project website at: http://daytimeproject.com/

INSPIRE Project

IMechE and C4FF joint New Fan Boat STEM Activity

OPTIMUM

The project has had its final review meeting on Thursday 10th of June 2021. The meeting was a success. The project aims to support innovative concepts for engineering, commissioning, control and supervision of smart manufacturing and material handling. It will be in line with European, National and international initiatives towards digital manufacturing, closely related to on-going activities in working groups around the German initiative Industry 4.0. Taking the results from ongoing architectural, component and ontology discussions, OPTIMUM's major goals are: improvement of the aspects of distributed control, adaptation of (I)IoT technologies to real industrial needs, enhancement of control and applications by context and location awareness as well as application design and common-model based 3D engineering and supervision.

For more information visit project website at: https://www.optimum-itea3.eu/

ITEA 3

Project Results

OPTIMUM

Ground-breaking results in the smart factory domain

EXECUTIVE SUMMARY

Focusing on distributed control, localisation, cyber-security and 3D engineering & visualisation, the ITEA project OPTIMUM (OPTimised Industrial IoT and Distributed Control Platform for Manufacturing and Material Handling) offers greater efficiency, safety and usability in future smart factories.

PROJECT ORIGINS

In today's factories, machines such as cranes are typically operated manually using heterogenous hardware. These are usually not interoperable and diverse control environments are in use; static machine configurations also make evolution hard to achieve. In a global market with strong competition, Industry 4.0 concepts like greater software modularity, interoperable frameworks and Industrial Internet of Things (IIoT) must be embraced to enable truly smart factories.

OPTIMUM envisions a clear link between real-time machine-to-machine (M2M) communication utilising distributed control, localisation awareness and 3D engineering & visualisation for smart factory applications. To avoid 2D layout tool limits, the project has enhanced design processes and solution validation using 3D models, simulation and supervision. Application design and development is supported via a common IIoT platform and a distributed control platform (DCP). Integrated context and location awareness enable better control and assistance. These results have now been validated with 15 demonstrators across four countries.

TECHNOLOGY APPLIED

Regarding 3D engineering and visualisation, the project aimed to utilise TARAKOS' 3D engineering tool for complete product lifecycles. From an engineering perspective, this can be used to visualise the manufacturing location to which machinery will be added and subsequently optimise material flow solutions (i.e. by simulating effects of cycle time versus cost). An important innovation was the introduction of a DCP which integrates secure elements and location awareness capabilities, allowing location-dependent assistance functions. This has been built on top of suitable real-time communication and interfaces an IIOT platform. Information is fed back to the 3D engineering tool to close the loop and further optimise future lifecycle management.

M2M & HMI communication in the German Material Handling demonstrator

From this starting point, OPTIMUM addressed many additional targets, including Human-Machine-Interfaces (HMIs), wearables for operator localisation and 5G technology application. Unlike a typical cascaded approach, control modules are distributed so that each actor – human or machine – can be located within the process in real time, enabling collaborative assistance functions. The 15 demonstrators effectively serve as showcases for the project's diverse technical results. Those implemented as prototypes include DCPs (IFAK), embedded boards (NXP), IIoT (University of Rostock, ERSTE), indoor localisation (COMNOVO), wearables (THORSIS & University of Rostock) and high-level assistance functions (DEMAG, ERMETAL, ETRI, MAGTEL).

In terms of cyber security, the project conducted a detailed STRIDE analysis to identify risks and vulnerabilities. For HMIs, a multi-level authentication concept was implemented to

request authentication for different access levels. M2M communication is secured by Secure Elements (SE) used for encryption in the OPC Unified Architecture (UA) protocol and DCP. Collaboration between cranes, hoisting devices and machines requires interoperability but existing standards for cranes are not yet ready for Industry 4.0 and human-machine collaboration. OPTIMUM therefore also established cross-company working groups to prevent a lack of standards from becoming a roadblock to exploitation. Work has begun on a companion specification for OPC UA, which is an essential step towards crane component interoperability.

MAKING THE DIFFERENCE

Thanks to high levels of collaboration within the consortium and the support of ITEA, OPTIMUM has overachieved in various ways. For technical outputs, a clear highlight is the development and implementation of five DCPs across 15 machines (versus a target of three machines), including cranes, automated guided vehicles and forklifts. Runtime visualisation has been created and contextual awareness is another unique, ground-breaking result. Against an initial goal of two market approaches, the consortium has now developed 38 short, mid or long-term exploitation approaches to bring such innovations to market.

OPTIMUM's competitive advantages are clear: the localisation of all actors will increase the safety of manufacturing environments; assistance functions should result in a significant reduction in assembly times (thereby improving resource utilisation and overall sustainability); and the closed loop of optimisation can reduce development times and therefore costs. 18 tools for third-party exploitation have so far reached TRL 4 (lab validation) or higher; a notable example is a software tool to support layout-based engineering and the visualisation of overhead travelling cranes. This is currently at TRL 7 (system prototype demonstration in an operational environment) and has allowed TARAKOS to enlarge their library and enter a completely new domain.

OPTIMUM has seen further successes in terms of dissemination and human capital, resulting in the hiring of 13 permanent staff and the completion of 43 bachelor's or master's theses and student works related to the project. Students have also played a unique role in the demonstrators (including scaling the German demonstrator down to create a 3D print) and the University of Rostock has integrated knowledge gained from the project into its courses. Having reached over 30,000 people via newsletters, guided tours and social media, the OPTIMUM consortium is highly committed to further developing the project's results, including transforming five patent ideas into marketable outputs. This spirit of collaboration is set to increase efficiency, competitiveness, safety and security and reduce manufacturing waste for many years to come.

MAJOR PROJECT OUTCOMES

Dissemination

- Project presentations at Customer Day & Open House at DEMAG in 2019.
- 2 Open IEEE Special Sessions at: ICPS 2020 SS-06 & IECON 2020 SS-62.
- Exhibition of OPTIMUM at Digital Days of Hannover Messe 2020.
- 43 Master thesis, Bachelor thesis, Student works.
- 16 Publications for IEEE Xplore.

Exploitation (so far)

- 18 ERTPs published and 38 Exploitation targets from a short-, mid- and long term prospective.
- 15 Demonstrators in four countries.

Standardisation

- VDMA cross-company working group on OPC UA companion specification for cranes & hoists.
- Initiation of FEM cross-company Task Force on future safety regulations for cranes & lifting equipment when utilising innovative assistance functions (collaborative processes).
- Contribution to GTA API for IIoT Devices (SE API) - IEC 30168 / DIN: NIA 41-02 AK / NWIP: ISO IEC JTC1 SC41 WG3 (Cyber Security).
- Contribution to ISA99/IEC 62443 - ISO/IEC 62443-3-3 and 62443-4-2 related standardisation activities (WG4 TG2 of ISA99).

Patents

- 5 Patent applications in preparation (8 partners from Germany & Turkey).

ITEA is a transnational and industry-driven R&D&I programme in the domain of software innovation. ITEA is a EUREKA Cluster programme, enabling a global and knowledgeable community of large industry, SMEs, start-ups, academia and customer organisations, to collaborate in funded projects that turn innovative ideas into new businesses, jobs, economic growth and benefits for society.

https://itea3.org

OPTIMUM
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Partners

Germany
Comnovo GmbH
Demag Cranes & Components GmbH
Institut für Automation und Kommunikation e.V. (ifak)
NXP Semiconductors Germany GmbH
tarakos GmbH
Thorsis Technologies GmbH
University of Rostock

Republic of Korea
Electronics and Telecommunications Research Institute (ETRI)
Handysoft Inc.

Romania
Beia Consult International

Spain
Ezeris Networks Global Services SL
Magtel Operaciones S.L.U.
Sotec Consulting

Turkey
DIA Yazilim San. ve Tic. A.S.
ERMETAL OTOMOTIV ve ESYA SAN TIC. A.S.
Erste Kurumsal Arastırma ve Yazılım Teknolojileri Ltd. Sti.

United Kingdom
Centre for Factories of the Future Ltd

Project start
November 2017

Project end
June 2021

Project leader
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School pupils 14 years old and over
Climate Action Competition

CW-AQPC, C4FF and Inspire Group Joint Climate Change Competition

We have a challenge for you!
A simple assignment after which your students answer quizzes. Then submit their answers to Professor Reza Ziarati at reza.ziarati@c4ff.co.uk. Areas covered are:

Emissions Overview

- Climate System and Global Warming
- Greenhouse Gas (GHG) emissions and Climate change
- Main GHG Emissions The main GHGs heat-trapping gases
- Climate Change Impacts on Oceans
- Combating Air Pollution: The Role of International Bodies
- Growth of Concern on Air Pollution
- Historical Developments
- The United Nations Environment Programme (UNEP)
- Intergovernmental Panel on Climate Change (IPCC)
- The United Nations Framework Convention on Climate Change (UNFCCC
- The Kyoto Protocol

The winning school will get £250, and a Certificate along with the winning students getting £100 each together with a Certificate. The students plus their teachers (2 Max) will be invited to our Annual Dinner event as our guests.
Our aim is for Schools to encourage both girls and boys to take part and hence can submit two entries one each from a female and a male student.
The winners will be announced at our Air Quality group conference in September/October 2021
To join the competition along with information on prizes please contact me reza.ziarati@c4ff.co.uk.

I look forward to hearing from you,

Prof Reza Ziarati

Latest Events

Air quality group Conference is scheduled for 14th October 2021. This conference will take place at Coventry University and will involve the key stakeholders throughout the greater Midland region; more on this in the intended next up-date of News expected in late August.

The Government's Response to C4FF on Matters Raised by the Centre about Pollution

In response to C4FF's efforts in helping to improve air quality, the Department for Environment Food and Rural Affairs, Secretary of State, Rt. Hon. George Eustice replied to Professor Ziarati with assurances that the Government is committed to tackling air pollution UK wide and huge progress has already been made in reducing emissions. Air quality has improved significantly; however, it remains one of the most persistent public health challenges of our time. Our understanding of the range and scale of health effects associated with air pollution is constantly improving and Defra continues to have extensive discussions with the Department of Health and Social Care and the research community on the relationship between air quality and health.

Government Recent Efforts – Climate Assembly UK: the Path to Net Zero

In a letter to Professor Ziarati, the Prime Minister, with regards to the advisory and academic panels working towards zero emissions, states that it is testament to your hard work that so many talented individuals and organisations from across the UK are involved.

As the UK's first citizens' assembly on climate change prepares to meet for the first time at the end of January, the two panels of stakeholders and researchers helping to ensure the balance and accuracy of the assembly have been announced.

A short report from Chair of Air Quality People's chamber, Professor Reza Ziarati to COP26 Working Group

Energy cannot be produced or destroyed but can be transformed from one form into another.

Higher temperatures have negative effects, and the higher CO2 emissions the higher is the atmosphere's temperature. We need to bring CO2 emissions to Zero if the global atmospheric temperature is to remain unchanged.

We have two choices, either stick to transport issues or go to the core of the problem namely, what it takes to containing the global warming within 1.5 degrees. The CO2 is still rising and global warming is getting worse.

As with Covid, climate change challenge should start with the Challenge the UN Paris Accord Climate Emergency to contain global warming within 1.5 degrees. So the Challenge is clear. Now that we know what the challenge is we must start from the science based facts from which we, as Engineers, will determine the appropriate solutions. It is suggested that Engineers may identify the appropriate solutions, but governments and businesses – hopefully with the concurrence of local councils, parliaments and peoples - will determine the adopted solutions].

Further more like the pandemic the solutions will only be successful if the whole society is helped to understand it and fully won to engage. A great example is the symbiotic relationship emerging in the USA on both these global challenges with progressive people power in tandem with progressive business and government.

It could be said the quickest and cheapest way to transition towards achieving the 50% carbon reduction by 2030 climate emergency on the road to net zero is leadership from government complemented locally with public, private and third sector local partnerships.

It should be noted that the progressive governments are convinced and the UK 2014 Road Map to a Brighter Future strategy is a good policy. What is now the game change is the election of a US President and Senate and Congress majority implementing this as opposed to the Trump sabotage.

Our research (C4FF) shows that to achieve UK 2014 Road Map to a Brighter Future, it is imperative to replace all of the fossil fuels we use with clean, green energy for power, heat and transport which is now commercially competitive. Carbon reduction requires the combination of energy/resource efficiency together with generating 100% of clean green power, heating and transport fuel which this project can contribute to including reducing carbon in the local environment with adverse impact on the people's quality of life as well as reducing premature death and morbidity which have a costly impact on the health system (NHS in the UK).

Capacity of building of local communities to help them develop, implement and sustain their solutions should be an important consideration.

It is imperative to help popularise the science of the climate emergency along with the range of clean green solutions solution essential for citizen and community engagement. Regular forums knowledge exchange, collaboration and partnership across all civil society organisations are essential. Particular attention should be given to school students using the STEM curriculum including using the school building for them to undertake a not only a solar mapping but what else is required to make theirs a zero carbon school.

It has to be appreciated that reducing the use of fossil fuels in power stations will greatly reduce emissions and will ease the pressure on transport system.

Furthermore, currently we are driving around with a 5% Ethanol blend in our petrol, right now; the EU target is to get that up to 10% when they can make enough; and the diesel is 7% Bio-Diesel made chemically from rapeseed, sunflowers and so forth. Most of the UK's ethanol is imported, mainly from USA, because we are so 'overcrowded' here that we cannot grow enough food, never mind grain for ethanol on top; this is called the 'fuel vs. food problem'. In the USA, something like **10%** of the total 'grain' (maize) crop is now turned into ethanol fuel.

Issues relating to transport

The average price of Electricity in US dropped from $2.5 in 1900 to $0.1 in 2020 ($ per kWh at 1990 prices). In fact the average price of electricity has dropped rapidly in the Western world and in many countries worldwide albeit not at the same rate as in the West. Yet, global carbon emissions from energy transformation have gone up from Zero in 1850 to almost 35 Gigatones in 2020. There has been almost a exponential rise in CO2 level. This is alarming. 26 billion tons of CO2 per year; more tons/person in the West/developed world and a lot less tons/person elsewhere, on average 5 tons per person worldwide. This is unacceptable.

The CO2 emissions are directly proportional to world population (P), CO2 per unit energy (C), Services per person (S) and Energy per service (E), namely: CO2 = P x S x E x C. If P goes up S will go up too but although E may drop and this may lead to a lower C, the anticipated increases in

population and current upward trend for greater need for Services would mean huge increases in CO2. So far CO2 levels have not been falling and we need a miracle to reduce CO2 level to maintain a safe global temperature.

There are no easy solutions. Wind, Solar and Hydrogen have huge problems of transmission and storage but the cost of transformation of free wind and solar energy to clean and usable energy is falling. One solution could be Nuclear and use of small, safer and highly efficient units spread over the globe rather a few numbers of huge power plants. In any case, Nuclear energy has its problems of cost, safety and long term storage. Another partial solution is carbon capture and its storage which poses serious engineering challenges of affordable cost, suitable locations and long term stability.

One method suggested by C4FF was conversion of wind energy to potential mechanical energy (Reza's Coil) and its storage. This one potential area which can have a huge potential as it removes the storage problem of wind energy.

On electrical energy all the batteries on earth can store about 30 minutes of the world's energy needs. There is a great deal about cars. Toyota which is the world's largest automakers, this week, reiterated an opinion it has offered before. That opinion is straightforward: The world is not yet ready to support a fully electric auto fleet. Just 2% of the world's cars are electric at this point. There are 289.5 million cars just on U.S. roads as of 2021. About 98 percent of them are gas-powered. Toyota selling 81% of its cars in the US warns that the grid and infrastructure simply are not there to support the electrification of the private car fleet. A 2017 U.S. government study found that we would need about 8,500 strategically-placed charge stations to support a fleet of just 7 million electric cars. That's about six times the current number of electric cars but no one is talking about supporting just 7 million cars. We should be talking about powering about 300 million within the next 20 years, if all manufacturers follow GM and stop making ICE cars. 300 million cars is still a drop in ocean and who is here in 20 years time.

There is no free lunch. Electrifying the auto fleet will require a massive overhaul of the power grid and an enormous increase in power generation; hence, the reason for success of Hybrid. Read award prize winning and given a national diploma award Ziarati (1995) paper to know why the time for hybrid vehicles is with us - http://www.c4ff.co.uk/history/papers/Emerging_transportation_system.pdf .

I believe the Government is saying the right things and doing a great deal of good, however the problem is that of strategy. We need to set up a strategy for most sustainable means such as reducing energy demand by reducing consumption and energy use followed by energy efficiency and utilisation of renewable and sustainable resources. The logic also dictates that the focus should also be on the least sustainable means such as utilisation of other low GHG-emitting resources as well as utilisation of conventional resources. The methodology in treating raw data on air quality and presenting it also is a cause for concern. We should pay greater attention to producing evidence; currently, there are a number of factors being used to amend raw air quality data which defies logic. Using and reporting on raw data from the diffusion tube measuring NO2, for instance, are cases for serious consideration. DEFRA officials and Ministers including Secretary of State overseeing the work of DEFRA are aware of my views on this subject.

The Policy Paper on Clean Transport, the Environment Bill, the draft industrial strategy report and work on an innovation strategy as well as DEFRA's three identified research ideas are all a way forward but several key points are worth being considered. I have already given my views to senior ministers in the Government on these key issues.

We must all do whatever we can to save our planet for our next generations. The role of any advisor should be to explain the fundamental Engineering and Scientific truth with the hope to enact better policies. I have some doubt about current AQEG to have sufficient and over embracing expertise of the realities viz., CO_2 emissions are still rising and global warming is getting worse. Particularly considering that the Government is not meeting its own air quality targets and yet intends to adopt WHO levels for key pollutants. The future is stark and this is why I am showing interest

RZ Solutions:

A major programme of reducing car journey and encouraging modal shifts from cars to bikes and from air to rail.

Electrification of the rail and re-use of existing tracks and development of massive rail tracks for the expansion of the rail.

Massive installation of solar panels on flat roof tops, car park and so forth.

Continuation with wind turbine instillation including R&D on more efficient units such as C4FF's twin bladed wind turbines

Massive investment in tidal and wave energy

Switch to hybrid propulsion system to counter air quality in cities and towns

Discourage the use of LNG until means have been found to reduce Methane emission some 100 times worse of CO2 with regard to its impact on global warming.

Encourage local small highly efficient nuclear power station using U238.

Reconsideration of using Ammonia for larger propulsion systems and use of Ethanol and Methanol in Internal Combustion Engines.

Apply RZ's Coil (Inertia wheels) to wind turbines to store energy

Encourage local stakeholder collaborations

Involve schools in climate change projects see attached IMechE Midland examples.

Invest in invention and research in energy efficiency and technologies to reduce emissions of harmful pollutants.

Progress Report

Dr Martin Ziarati