

Achieving Sustainability through Science and Technology

FLOGEN Technologies Inc. is a high-tech technology company independently incorporated in Canada and USA, with offices around the world.

The CEO of FLOGEN Technologies Inc. is Dr. Florian Kongoli, who was awarded last month “The Environmental Tech CEO of the Year 2017”

The following is a profile of Dr. Kongoli and of his company FLOGEN Technologies Inc., whose intensive work on sustainable technologies all over the world was the key factor in granting him this award. During our interview with Dr. Kongoli, he provides his major points of view on the thorny issues of our current reality.

 Dr. Florian Kongoli is CEO of FLOGEN Technologies Inc. (www.flogen.com), a high-tech technology company independently incorporated in Canada and USA, with representative offices around the world. It mainly specializes in two objectives: (a) the development of new sustainable technologies and (b) transforming existing technologies into sustainable ones.

The firm's areas of expertise include: metallurgical, chemical, and environmental industries; various smelting, converting and refining processing in non-ferrous (Ni, Cu, Zn, Pb, Fe-Ni, Fe-Cr, PGMs, etc.) extraction and processing; iron and steel

making; and recycling and waste treatment.

FLOGEN Technologies Inc. has developed unique proprietary design, decision-making, control, optimization, and automation systems that have been successfully applied in various companies around the world, covering almost all existing technologies and generating operation savings that range from US\$ 5 to \$ 15 Million per year.

Last year the company celebrated 20 years of successful operations and business excellence, which is attributed to the application of his unique systems in almost all smelting, converting, refining and recycling reactors (Mitsubishi, TSL, Flash,

Teniente, Noranda, Plasma, Pierce Smith, Hoboken, Anode, Waelz, Roasters, Electric, Sintering, Pelletizing, Blast, Shaft, BOF, etc.)

The contribution of the company in sustainable technologies has been widely recognized. This includes excellent reference letters from major industrial companies, as well as two letters that the company received last year by the Minister of Foreign Affairs and Minister of Natural Resources of Canada, which recognized “the significant contribution that FLOGEN makes toward scientific research related to new sustainable technologies.”

The News Section of the FLOGEN Technologies Inc. web site (www.flogen.com/news.php)



Dr Florian Kongoli - “The Environmental Tech CEO of the Year 2017”

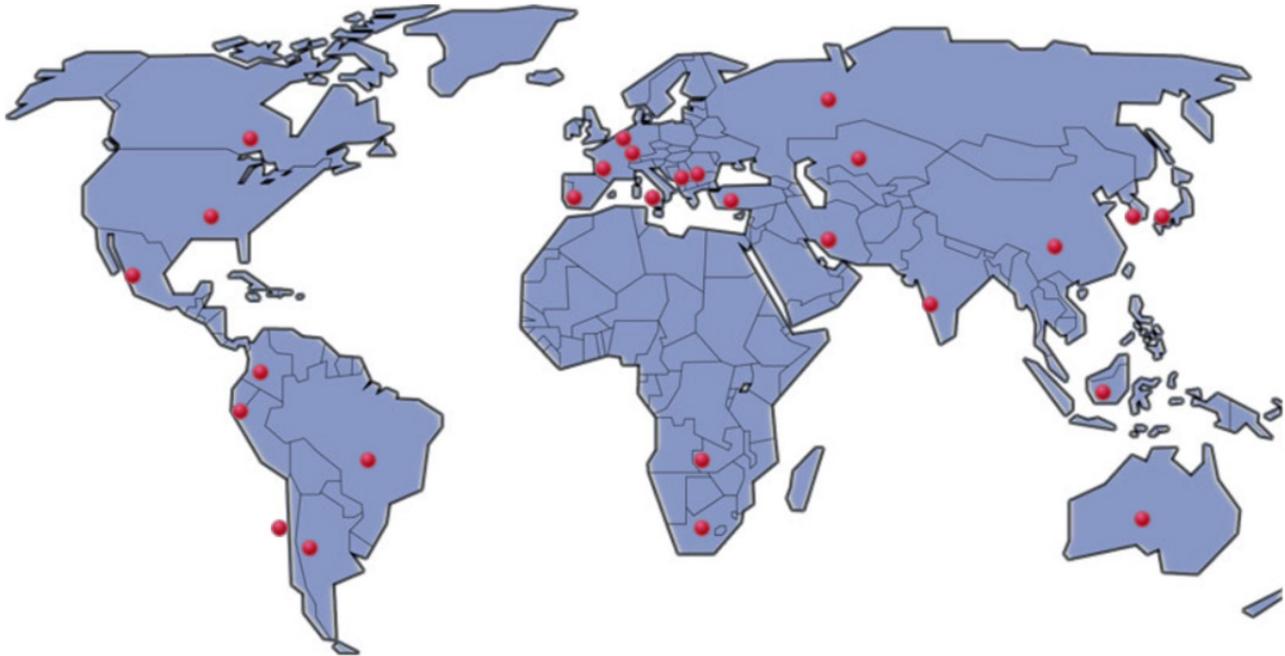
reflects the vast and intensive worldwide activity of Dr. Kongoli, and his dynamic involvements are truly impressive. For most, the intensity of his commitments

Projects

Metallurgy

Chemistry

Environment



might very well appear to border on the verge of impossible; but in fact, upon following the activity described in the company's website, this has been this CEO's normal working schedule since at least 2008. This schedule is filled with numerous research activities, scientific and technology publications, as well as frequent visits around the world on technology business, conferences, as well as meetings with political leaders. His impressive list of meetings include numerous Nobel Laureates, CEOs, and political leaders such as: Prime Minister of Canada; President of Finland; President of Chile; Prime Minister of Netherlands; Members of UK House of Lords; Ministers of Foreign Affairs, International Trade and Transports of Canada; European Union Commissioner for the Environment; Premiers of Quebec and Manitoba; Governor of Florida, USA; Ministers of Natural Resources, Intergovernmental Affairs, Transportation; Minister of Economic Development, Health, and Social Services of Quebec; Ontario Minister of Research and Innovation; President of Kosovo; Prime Minister and Deputy Prime Minister of Kosovo; Prime Minister and Minister of Education of Albania; Ministers of Mining and Minister of

Environment of Chile; Minister of Environment and National Resources of Mexico; Minister of Environment of Poland; Seychelles Minister of Foreign Affairs; Minister of Environment and Energy of Maldives; Ministers of Commerce and Industry, New and Renewable

Energy, and Union Cabinet Minister of India; Ministers of State of Environment and of Health and Social Services of Portugal; Ministers of Agriculture, Forest, and National Environment Commission of Bhutan; Minister of Sustainable Development, of Forest Economy and

Environment of Congo; Minister of Water & Environment of Uganda; Union Minister of Environmental Conservation and Forestry of Myanmar; Environment Secretary of Kenya; Speaker of the Canadian Senate; many other senators and members of parliaments of Canada and European Union, etc.



Dr. Florian Kongoli with the Right Honourable Justin Trudeau, Prime Minister of Canada, in June 2017

Based on an interview he gave us, we will be summarizing the vast activity of this exceptional CEO in two sections: firstly, we will outline his experience and accomplishments in the arena of applied industrial research and development, as well as his impressive network of academic connections; secondly, we will explore his lifelong commitment to achieving sustainability through science and technology, and to raising the profile and importance of scientists and engineers in society.

An Accomplished Scientific and Technology Career

In the past 25 years, Dr. Kongoli's experience has encompassed both sustainable industrially applied research and development, as well as academic lecturer experience in many invited engagements throughout Asia, Africa, Australia, Europe, North America, and

South America. He is highly involved in both industrial and pure scientific projects, which comprise of a wide array of fields such as: design, decision-making, control, optimisation, and automation of processes and flowsheets; physical and thermochemical modelling; and physicochemical properties of mattes, metals, gases, and oxysulfides.

Through his work with FLOGEN Technologies Inc., Dr. Kongoli has successfully carried out many industrial projects for more than 47 well-known metallurgical and chemical companies, such as Mitsubishi Materials Corporation, Sumitomo Metal Mining (Japan), Falconbridge (now Xstrata/Glencore-Canada), Western Mining Corporation (now BHP Billiton-Australia). He has also enjoyed productive collaborations with several well-known higher education establishments from around the world, such as Tohoku University (Japan), Curtin University (Australia), and University of Montreal (Canada).

In addition, Dr. Kongoli has published and edited 51 books, and 120 scientific articles in professional peer-reviewed journals during the last five years. These have addressed a wide range of topics, such as process control; optimization and automation; development of novel sustainable technologies; physical modelling of various properties of industrial mattes, metals, and effects of minor components and fluxing strategies.

He has delivered approximately 200 plenary, keynote, and invited presentations, as well as articles, technical reports, and research presentations in 20 countries around the globe. The results of his work, and FLOGEN's control and automation systems, have been used by companies throughout the world.

He has taught several continuing education courses, including Sulfide Smelting: Principles, Technologies, and Environmental

Considerations held in San Diego, CA, USA in 2003, and Modern Technologies in Non-Ferrous Smelting & Recycling: Efficiency, Control, Energy, and Environmental Issues, held in Cancun, Mexico from November 27th to December 1st 2011.

Reflecting upon his career, Dr. Florian Kongoli says: "I have enjoyed serving in many leadership positions, in both national and international organizations. I have found my involvement in various positions - for instance as a chair, vice-chair, or member - of about 20 professional society committees truly rewarding."

Dr. Kongoli's excellent business management and organization skills have been instrumental in steering his company toward new ground breaking technologies.

Furthermore, Dr. Kongoli serves as an editorial and scientific board member of several professional journals, including:

- The Metallurgical and Materials Processing E (USA);
- The Minerals and Metallurgical Processing Journal (USA);
- Mineral Processing and Extractive Metallurgy (UK/Australia);
- Erzmetall (Germany);
- European Journal of Mineral Processing and Environmental Protection (Turkey/Europe);
- Journal of Metallurgy (USA/Egypt);
- Journal of International Environmental Application & Science (Turkey/Europe);
- Journal of Mining and Metallurgy (Serbia/Europe) and;
- Journal of Industrial Engineering (USA/Egypt);
- InTech (Croatia/Europe and Shanghai/China,
- International Journal of Engineering Business Management (Croatia/Europe).

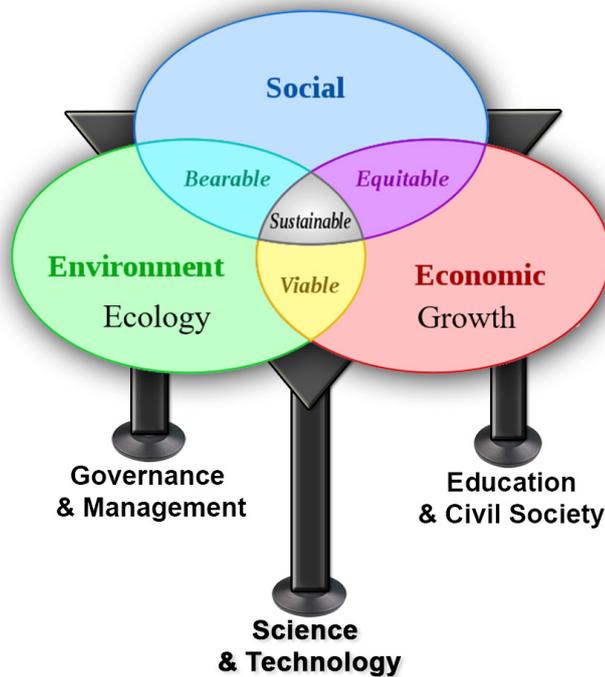
Dr. Kongoli has also served as a member of organizing committees and scientific committees, of about 80

professional international conferences, across all continents. Today, he is a member of the Industrial Achievement Award Committee of International Federation of Automatic Control.

In addition to his business, Dr. Kongoli is also the founder and chairman of FLOGEN STAR OUTREACH (www.flogen.org), a non-profit international organization dedicated to achieving sustainability through technology, and raising the social profile and importance of scientists, technologists, and engineers and their supporters towards realizing a sustainable future (both subjects to be dealt later in this article). Through this organization, he has successfully coordinated and chaired the FLOGEN flagship annual event: Sustainable Industrial Processing Summit (SIPS). This event features some of the most well-known personalities in the world of science and technology.

Some of the most notable events are detailed below:

- **Yazawa International Symposium** on Metallurgical and Materials Processing: Principles and Technologies (www.flogen.org/YazawaSymposium), held in San Diego, California, USA, in March 2003. This event had 31 sessions and more than 3000 pages of publications from authors from 36 countries around the world - the biggest international symposium at the time in its class.
- **Sohn International Symposium** on Advanced Processing of Metals and Materials: Principles, Technologies and Industrial Practice (www.flogen.org/SohnSymposium), held in San Diego, California, USA, in August 2006. This event set a new record, surpassing the magnitude of the previous symposium with about 500 papers from authors from 80 countries and about 6000 pages of publications.
- **SIPS 2011: Fray International Symposium on Metals and Materials Processing in a Clean Environment** (www.flogen.com/FraySymposium), held in Cancun, Mexico, in November/December 2011. This was another record breaking symposium in many aspects, with about 500 abstracts from authors from 85 countries around the world, culminating in seven volumes of publications of more than 4000 pages. This event was sponsored by 230 societies and organizations worldwide, including 10 major industrial corporate sponsors, and three government financial sponsorships.
- **SIPS 2013: American Automatic Control Council/ IFAC International symposium of Automation** in Mining, Mineral and Metals held in San Diego, California, USA, in August 2013; (www.flogen.org/MMM2013).
- **SIPS 2014: Shechtman International Symposium dedicated to Prof. Shechtman, the 2011 Nobel Prize Winner in Chemistry** (www.flogen.org/ShechtmanSymposium), held in Cancun, Mexico, in June/July 2014. About 500 abstracts from authors from 80 countries around the world, were published into 7 volumes of more than 4000 pages.
- **SIPS 2015: Sustainable Industrial Processing Summit & Exhibition**, (<http://www.flogen.org/sips2015/>) held in Antalya, Turkey, in October 2015. This event had more than 500 abstracts from authors from 80 countries around the world, published into 11 volumes of more than 5000 pages.



New FLOGEN Sustainability Framework

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- SIPS 2016: Sustainable Industrial Processing Summit & Exhibition**, held in Hainan Island, China, in November 2016:(<http://www.flogen.org/sips2016/>). More than 500 abstracts from authors from 80 countries around the world, and 11 volumes of publications.

Sustainability Framework

Given today's complicated and ever confusing descriptions of sustainability, we asked for Dr. Kongoli's perspective on this issue. He agreed that there exists a confusion, and refers to his recent publication:

"The criteria, the actors, the goals, have been unsystematically mixed without a clear distinction. The original definition of sustainable development has 3 intersecting criteria: environmental protection, economic development, and social development. In order to achieve sustainable development, these three criteria need to be fulfilled simultaneously. Additional

inclusions of culture, politics, governance, and institutions as defining criteria is illogical. Culture is part of social development, which is already one of the criteria for sustainable development. Politics, government and institutions are actors that can achieve or undermine sustainable development with their actions, laws, regulations etc. It is extremely important to have a clear distinction between the definition of sustainable development as a set of criteria to be achieved and the actors that can either help achieve or undermine these criteria.

Dr. Kongoli shows us his newly designed graphical schema of sustainability framework, which has been published previously and also reproduced above.

Sustainability and Automation

Given today's somewhat negative view in society about automation as a job destroyer, we asked him about the link between automation and sustainability – both subjects that

are the major specialties of his company.

He replies that a quick look at the history of the 20th century shows that automation has been perpetually under attack for taking away jobs from society. Despite that, automation has been developing continuously and applied in all aspects of life.

Taking away jobs makes automation look like it does not fulfill the social and economic development criteria of sustainable development. However, the reality has to be looked at in the big picture and not in isolated domains. He refers us to a full analysis on the subject, which is carried out in both a recent article he published, as well as in his 2012 book "Automation". The latter recently reached a record of 55,000 downloads. In its preface, he writes:

"Automation is closely related to the modern need for sustainable development in the 21st century. One of the principles of sustainability is "Doing More

with Less", which in other words, is also one of the goals of automation. By replacing the routine part of human labor with the use of machines, automation not only increases productivity and the quality of products beyond what can be achieved by humans, but also frees space, time, and energy for humans to deal with the new, non-routine challenge of developing innovative and more advanced technologies. This magnificent cycle, in which established developments are automated and the free resources achieved by this automation are used to develop newer technologies that are subsequently automated, is one of the most successful recipes for the human race towards the goal of sustainable development."

Sustainability: Recycling or Landfilling

Given the existing contradicting theories and movements that exist today on the best feasible way to treat a waste through recycling or landfilling, we asked Dr. Kongoli for his opinion.

He said that it is true that some purely recycling companies have gone bankrupt because of the high cost of recycling technology used. However, recycling is always a sustainable practice if the economic criteria of sustainability is fulfilled. Landfilling is sustainable only if no feasible and competitive cost-wise technology of recycling exists.

He mentioned that historically, the philosophy of any technology and industrial practice has been to produce high performance products, and landfill any related process waste. Based on this philosophy, the old Central Paradigm of Materials Science and Engineering was defined as:

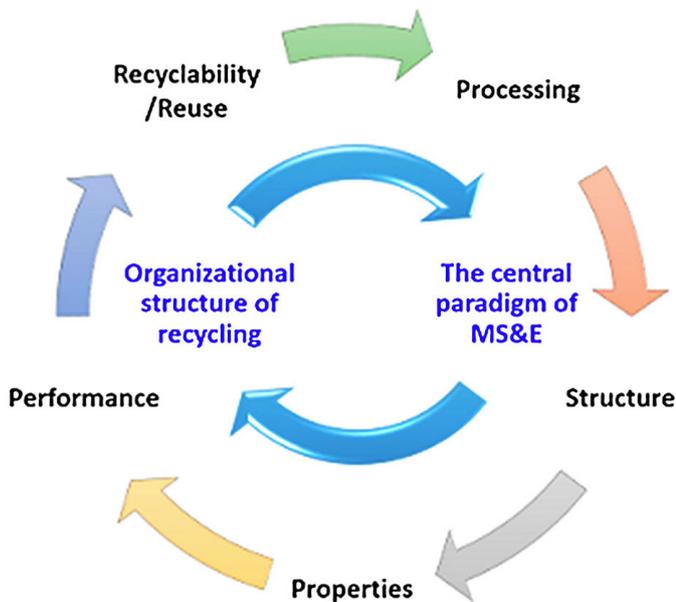
Processing -> Structure -> Property -> Performance

Dr. Kongoli and his colleagues have proven that this is not sustainable, and they have proposed in their publications a Modified Central Paradigm of Materials Science and

Engineering that includes recycling as a sustainability dimension:

Processing -> Structure ->
Property -> Performance ->
Reutilization/Recyclability

They have represented this new paradigm in a circular way as given below:



New Circular Central Paradigm of Materials Science and Engineering

However, in order to be sustainable, the recycling technology used needs to be cost effective, thus fulfilling one important dimension of sustainability. It is exactly here that the role of science and technology is primordial.

Sustainability Through Science and Technology

Dr. Florian Kongoli believes that the role of science and technology in sustainability is a diagnostic and strongly remedial one. Dr. Kongoli elaborates on his views on this subject.

The role of science, technology and engineering has almost been overlooked in the last 25 years in the social and political debates related to sustainability, environmental protection and climate change. The attention has been placed on areas such as social awareness, economy, management, and education—

all of which are important— but rarely on science, technology, and engineering as one of the most important solution-providing factors in sustainability.

“Science has been often credited only for its diagnostic role in pointing out and demonstrating numerous issues facing the environment

and climate change in the 20th and 21st centuries. It is positively referred to for showing the problems and providing scientific measuring results to demonstrate problems, such as average global temperature increase and other various associated issues. However, from that point, the ball (recognition) seems to stop rolling. Although it is good to credit science, technology, and engineering for their diagnostic role, this is only half of their contribution. The other and most important part, is neglected.

“Simple research shows that there is a very high number of studies from centers around the world, that have produced countless comprehensive reports about the economy, social awareness, management, education, and way of life as solutions to both climate change issues and sustainability. A great deal of money has been spent in various countries on these

studies that, while valuable, tend to repeat the same ideas and are inflationary when it comes to results and conclusions. Studies on why and how technology can solve the issues of climate change and sustainability, are virtually non-existent.”

In international socio-political gatherings on sustainability where Dr. Kongoli has participated, the role of science, technology, and engineering has been frequently ignored. Dr. Kongoli then goes on to develop a fascinating point.

“Other aspects have been extensively discussed, yet science and technology has rarely been in the picture. Some well-known speakers, with social and economic backgrounds, have often publicly considered the role of science and technology as a delayed, inefficient, or non-affecting factor in solving pressing climate change issues. Instead, they have opted to create and establish arbitrary new laws and regulations as the only remedial actions available, without even consulting science and engineering.

“In my opinion, this seems to be not only a good non-starter, but also ironic. They refer to scientific studies to provide evidence for global warming, and as a basis to establish action plans to remedy the problems. However, these actions that originate from science, somehow do not include science and technology as an important solution.

“I have publicly countered and debated vigorously on this stance with scientific and technological concepts in various socio-political meetings. I’m glad to say that I have successfully changed the minds of several of these individuals, about the role of science and technology.”

Dr. Kongoli then reveals the limitations that exist in non-exact science domains. He recounts Queen Elizabeth II of England’s visit at an economic institute, sometime after the economic crisis of 2008.

“When the director of the institute was explaining to her their work on analysing the economic data and predicting the economic future, the Queen asked a simple question: ‘If, as you say, you predict the economy, why could you not predict the economic crisis of 2008?’ The director responded: ‘Your majesty, if we would have known, we would have predicted it.’

“In another case, in a meeting I was at about a year ago, a recent Nobel Prize Laureate in Economics declared in his major speech, that for any bad prediction on the economy by economists, the people to be blamed are not economists but politicians.

“As UK Lord Prescott said, in one of the FLOGEN summits, it is easy to put the blame on ‘externalities’ for any inability of economics to properly predict economic phenomena. According to him, there is evidence that more and more people will use this as a reason to justify why they are not able to achieve the objectives of sustainability.”

Lord Prescott went even further in his speech, saying that “The natural law of economics has not worked, and has certainly not achieved sustainability. As one economist said, this was probably the largest failure of the market operating system to keep it in balance.”

In contrast, science and technology are generally exact when it comes to prediction, Dr. Kongoli adds. He then offers his thoughts on the issues around real sustainability.

“For any possible failure, scientists, technologists, and engineers cannot blame externalities or anybody else for their failure except themselves. However, science and technology are not problem-free. They have their own issues, although they are of a different nature.

Sustainability is frequently an unfamiliar concept for scientists consider it as a



Pictured from left to right: 2011 Nobel Laureate Prof. Dan Shechtman, UK Lord John Prescott, Dr. Florian Kongoli, 2010 Nobel Laureate Prof. Ei-ichi Negishi at SIPS 2015 in Antalya, Turkey

the scientific community in everyday work, and many scientists consider it as a political subject rather than a scientific one. Sometimes when there are scientific inventions or technological breakthroughs, they are claimed to be sustainable only in their local field. Having said that, if they miss the big picture, they are not sustainable.

“I firmly believe that scientific achievements can be used in both a positive and sustainable manner, or in a negative and non-sustainable way. For example, the dynamite invented by Alfred Nobel for the mining of minerals, was eventually also used as an explosive in wars that followed.”

Due to its very nature, there are exact sciences and technology that can provide long term and sustainable solutions for climate change and global warming, Dr. Kongoli explains. He elaborates on these thoughts as he concludes this in-depth interview.

“In the last half of the 20th century, it was science, technology, and their innovations that saved the world from apocalyptic and accurate predictions that resources (food and water) were depleting. Since climate change is mainly caused by carbon dioxide going into the atmosphere through the

burning of oil, coke, coal, and natural gas, scientific research can develop new alternative technologies that either do not produce carbon dioxide, capture carbon dioxide and use it for beneficial purposes, or reduce the risk factors of existing carbon-free technologies, such as nuclear, to make them more suitable for society.

“Science and technology make it possible to achieve all the above, and not only without sacrificing the current achievements by society in quality of life or other aspects, but they can also help in improving and developing current and future achievements. That is why science and technology should not be in the shadows as it is right now, but rather it should gain its prime role among other disciplines; finding and applying scientific and new technological solutions to effectively solve the issues of sustainability and climate change is certainly the right way to go.

“Politics can be used in a positive sustainable or negative non-sustainable way. It can force the use of the sustainable inventions of science of technology in a wrong and non-sustainable way, as it did with dynamite. That is why, in a FLOGEN summit, Lord Prescott mentioned that the most useful role of politics, is to determine the best legal frameworks for the

development and use of scientific inventions in the right capacities.

“I have consistently and strongly advocated that the winning formula for succeeding and achieving sustainability, is fostering close cooperation between science, technology and engineering, politics, economy, and society, and leaving no one behind. A close and strong cooperation would ensure generous investments in financial resources from the economic sector, as well as human resources from the political sector in scientific and technology research. This would help us find the best short and long-term solution to the sustainability issues we face today.

“Every individual and every profession is important in this world, but a specific order of actions and priorities needs to be followed in order to be successful, and this starts with science and technology. The technology has the first and last word. As such, generous financial and human investments in scientific research and technology, is the best short and long term solution to the sustainability issues we face today.

“As seen above, the role of science and technology in

sustainable development is primordial. However, scientists and engineers are not properly recognized for their important contribution in the society. They need to be better recognized at a society-wide level for the crucial work they do in terms of sustainability.”

FLOGEN Star Outreach, a not-for-profit corporation, founded and chaired by Dr. Florian Kongoli, pioneered this work about 15 years ago, and is continuously working towards this vision with their yearly summits held around the world.



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