

**REPORT**  
**IORA Workshop**  
**Biomedical-engineering**  
**and other**  
**Innovative Technologies**  
**with relevance to**  
**Post-Disaster Situations**

**18 – 21 November 2019**  
**Aachen - Germany**



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## Executive Summary

The Indian Ocean Rim Association (IORA) Member States, located within and around the Indian Ocean region (IOR), are prone to both natural and man-made disasters such as earthquakes, tsunamis, typhoons, floods, droughts, volcanic eruptions, oil spills, and water, sea and air pollution. Management of disaster risks is particularly urgent in the IOR because it is home to small island nation states and developing littoral countries with high population densities, which suffer tremendously during calamities due to the lack of resources and assets. Disaster Risk Management (DRM) is therefore an area of collective interest to IORA Member States and a prerequisite to build resilient communities.

However, while early warning and precautionary measures are crucial to reduce the risks for damages and losses of life associated with these hazards and disasters, relief operations and rescue services are equally important to help restore the damages to public infrastructure, private properties, and human lives. Once a disaster has struck an area, rescue teams fight against time to provide relief and to save the lives of severely injured survivors. Appropriate medical knowledge and expertise is scarce and can often not reach in time to provide adequate relief measures and support to devastated areas. As a subsequent impact of such a disaster, drinking water and safe sanitation solutions are in short supply, and threaten communities through the spread of communicable diseases. There are several technology solutions that can assist to reduce and contain these risks. Therefore, it is important that the respective rescue teams and their backoffice supporters from various DRM agencies from IORA Member States, strengthen their knowledge and expertise within this field, through the implementation of innovative technologies and scientific solutions.

It is with a view to these aspects, that the Dept. of Physiology, RWTH Aachen University, IORA Regional Centre for Science and Technology Transfer (IORA-RCSTT), with the support of Germany as a Dialogue Partner, through GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and the IORA Secretariat, initiated the IORA Workshop on Biomedical-engineering and other Innovative Technologies with relevance to Post-Disaster Situations which was held from 18 – 21 November 2019 in Aachen, Germany (Annexure: 6).

The opening ceremony held on 18 November 2019 at the Centre Charlemagne, welcomed IORA participants from 11 IORA Member States (Bangladesh, Iran, Madagascar, Malaysia, Maldives, Mauritius, Seychelles, Somalia, South Africa, Sri Lanka and Tanzania), including expert speakers from the RWTH Aachen University. Prof. Dr. K. Mottaghy Dept. of the Physiology, Medical Faculty, RWTH Aachen University, mentioned that “this workshop is very important for us to develop key

recommendations with relevance to post-disaster situations for IORA and we are thankful to our invited experts from various fields to provide valuable insights to the participants”.

During his welcome remarks, Prof. René H. Tolba, Dean of Research from the Medical Faculty, RWTH Aachen University, acknowledged the impacts of climate change which bring new challenges for the area of DRM, scientists and researchers. He referred to the Latin saying “if you are seeking for peace, be prepared for war”, emphasising the importance of preparedness and response. He further welcomed IORA participants to Aachen and encouraged the sharing of knowledge and best practises.

Dr Tahereh Miremadi from the IORA-RCSTT stressed that “The world of science, technology and innovation is an exciting area in which to network and interact. We all continue to meet and bring inspired people together in forums like this to ensure that IORA remains at the cutting edge” during her welcome address (Annexure: 2). She furthermore highlighted that this Workshop is the result of the interaction between the two fields of science and technology on the one hand, and crisis management on the other, which have evolved together for innovative solutions. The idea of this Workshop was raised and discussed more than two years ago between the IORA-RCSTT and RWTH Aachen University, which gradually gained momentum after the Country Statement delivered by Germany at the 18th IORA Council of Ministers Meeting held in November 2018 in Durban, South Africa. This workshop is part of Germany’s ongoing support to strengthen IORA’s priority area of DRM and its Secretariat.

Various experts and professionals from Germany, Iran, Japan and Italy (Annexure: 3) delivered insightful and thought-provoking lectures on a variety of subjects and fields related to the area of DRM. On Monday, 18 November, Session One and Two (Annexure: 4 p. 12 - 17), lectures delivered focussed on topics related to: Pain, Telemedicine Systems, Trauma Care in Germany, Smart Textile Medical Solutions, Disaster Preparedness for Infectious Diseases, Flood Events and the role of Smart Sensor Technologies. Participants had the opportunity to visit the Institute of Textile Technology (ITA) and the Institute for Hydraulic Engineering and Water Recourses Management (IWW) during the lectures to gain practical insights into the topics covered. After the visits to the Institutions, the RWTH Aachen University organising committee welcomed the IORA participants at a welcome dinner.

On Tuesday, 19 November, Session Three and Four (Annexure: 4 p. 18 - 27), was held at the Aachener Gesellschaft für Innovation und Technologietransfer (AGIT). The lectures delivered by experts focussed on topics related to: Closed-loop Control of Therapy in Post-disaster Situations, Sea Water Desalination, the Revitalization of Fukushima Prefecture and Challenges of Creating New Industries, Antioxidant Dialysis Treatment and Portable X-ray Tube, Telemedicine and Telehealth in Disaster Management, Emergency Medical Services (EMS) Calls, Innovative Concepts in Organ Transport,

Innovative Approaches in Training and Teaching concerning Patient Safety and Innovative Systems for Cardiopulmonary Devices. In preparation for the round table discussion, which was held on Thursday, 21 November, participants received a DRM feedback form (Annexure: 5) with questions developed in accordance to the draft regional IORA DRM Work Plan and the draft Terms of Reference (TORs) for the IORA Core Group on Disaster Risk Management (CGDRM), as a guideline to assist participants in recommending actionable and practical inputs for the Workshop “Key Takeaways” document.

On Wednesday, 20 November, participants were provided the opportunity to visit the MEDICA and COMPAMED Exhibition in Dusseldorf. MEDICA is the world’s largest medical trade fair, with more than 5,100 exhibitors from 70 countries in 17 halls. Whereas the COMPAMED Exhibition, is the world’s leading platform for state-of-the-art medical technology, innovative materials and services. In recent years, COMPAMED has developed into a global hotspot for complex high-tech solutions in micro- and nanotechnology. IORA participants were able to visit the exhibition halls of their interest, and to network with leading businesses and researchers within the medical industry.

The round table discussion held on Thursday, 21 November at the Conference Hall of the Hotel am Marschierort, provided participants the opportunity to share and suggest inputs to the Workshop “Key Takeaways” document (Annexure: 1). The draft document was prepared by the Secretariat in consultation with the IORA-RCSTT on Tuesday, 19 November, and was screened for discussions and inputs at the round table session. Participants suggested actionable inputs related to post-disaster situations and as per the knowledge gained throughout the two-day lectures. The same draft was shared after the discussions with the participants for additional suggestions and inputs from their respective DRM agencies/ministries which were submitted to the IORA Secretariat for compilation.

The Workshop “Key Takeaways” highlight the requirement to; Integrate next generation DRM technologies and expertise; Collate an IORA disaster risk map and needs assessment; Promote the adjustment of national guidelines for procedures in Disaster Risk Reduction (DRR) among IORA Member States based on the Sendai Framework; Promote the delivery of training, exchange and capacity building programmes by Member States and Dialogue Partners in the area of DRM; Enhance knowledge among Member States and Dialogue Partners on specific relevant technologies for post-disaster situations, among other recommendations listed in the document.

The “Key Takeaways” was submitted to the Republic of India, as the current Lead Coordinator for the priority area of DRM, for inclusion to the draft DRM Work Plan which is to be finalised by IORA Member States at the First IORA Experts Meeting on DRM in 2020. Participants were additionally requested by the IORA-RCSTT, to share their country DRM profiles to collate a study on the current DRM challenges encountered within the IOR.

During the closing session, Dr Tahereh Miremadi from the IORA-RCSTT, Prof. Dr. K. Mottaghy Dept. of the Physiology, Medical Faculty, RWTH Aachen University, Dr Thomas Krimmel, GIZ Representative and Ms. Daniëlla Smit, IORA Secretariat Project Officer, delivered a vote of thanks to the RWTH Aachen University team, for the excellent assistance and hospitality arrangements, and to the IORA participants for their valuable inputs during the Workshop. As the main aim of this Workshop was to enhance capacity building through understanding and sharing advanced biomedical engineering and other innovative technologies that are of relevance in post-disaster situations, the IORA-RCSTT, RWTH Aachen University and GIZ, expressed their interest to host a follow up Workshop or training session to further strengthen the transfer of knowledge and innovative technologies.

Building upon the momentum of enhancing a 'green culture' in organizing Workshops, the RWTH Aachen University, GIZ and IORA Secretariat team made a special effort to make this Workshop participation as environmentally friendly as possible. This was done by using energy efficient trains to and from Frankfurt Airport to Aachen, and by avoiding single-use plastics for the participant workshop kits. Participant badges which were printed on recycled wooden wedges for this 'going green' concept. Additionally, to increase the visibility of IORA, the Secretariat provided the official IORA social media page links to the participants to share their experiences and follow the Association news. The official Workshop press release was also published online at [www.iora.int](http://www.iora.int) (Annexure: 7), along with pictures from the sessions and visits (Annexure: 8).

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## **IORA Workshop on Biomedical-engineering and other Innovative Technologies with relevance to Post-Disaster Situations**

**18 – 21 November 2019**

**Aachen, Germany**

**Enhancing and building capacity to manage post-disaster situations through medical and technology transfer between IORA Member States and Dialogue Partners, participants from 11 IORA Member States (Bangladesh, Iran, Madagascar, Malaysia, Maldives, Mauritius, Seychelles, Somalia, South Africa, Sri Lanka and Tanzania), the IORA Regional Centre for Science and Technology Transfer (IORA-RCSTT) and RWTH Aachen University Academics, developed an outcome document for submission and consideration to IORA.**

### **Recommendations by participants and experts present at the Workshop suggested to:**

- Integrate next generation of Disaster Risk Management (DRM), including technologies, expertise to be shared and exchanged;
- Recognise the importance of Information and Communications Technology (ICT) to assist Member States in post-disaster situations;
- Promote the adjustment of national guidelines for procedures in Disaster Risk Reduction (DRR) among IORA Member States based on the Sendai Framework;
- Collate an IORA disaster risk map and needs assessment;
- Establish an inventory of procedures (human resources, equipment, medicine, infrastructure etc.) and techniques/strategies as a basis for a regional analysis of best practises and gaps by IORA Regional Centre for Science and Technology Transfer (IORA-RCSTT) in consultation with the IORA Core Group for Disaster Risk Management (CGDRM);
- Collate a DRM overview analysis on IORA Member States and other regional organisations DRM plans/strategies;
- Organise the sharing of disaster mitigation and response techniques by IORA-RCSTT in collaboration with the IORA CGDRM;
- Develop suggestions and recommendations to enhance national and regional strategies for DRM;
- Promote the delivery of training, exchange and capacity building programmes by Member States and Dialogue Partners in the area of DRM;
- Enhance early warning systems through new technologies and improved communication channels;
- Enhance DRM awareness, especially in post-disaster situations, through education, media usage and simulation exercises;

- Establish an IORA 'Rapid Assistance Response Mechanism' (including but not limited to: committees, team members, intergovernmental assistance structures etc.) through the IORA CGDRM to assist Member States during disaster situations;
- Further enhance knowledge among Member States and Dialogue Partners on specific relevant technologies for post-disaster situations, including but not limited to:
  - Water treatment/reuse, recycling and water quality assurance;
  - Sea-water desalination and water purification technology;
  - Environmentally friendly Safe sanitation solutions;
  - Adapted automated hospital technologies;
  - Educational training for patient safety;
  - Telehealth and telemedicine;
  - Hydraulic engineering technologies for disaster prevention; and
  - Flood mitigation, ground water and storm water reclamation technologies.
- Promote DRM medical and technological exhibitions within the Indian Ocean region for the effective transfer of knowledge on a regular basis; and
- Enhance cooperation with civil society organisations, including regional and national non-governmental NGOs.

**\*Specific Workshop Proposals:**

- Request the IORA CGDRM and Member States to share information on respective DRM strategies/maps, in line with the inventory outlined by the IORA-RCSTT above;
- Conduct follow-up Workshop/Training Group Sessions on specific post-disaster topics; and
- Promote interdisciplinary exchange and cooperation on technology specific solutions/recommendations to be organised through the IORA CGDRM.

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**Welcome Address by Dr. Tahereh Miremadi,**

**Director, IORA Regional Centre for Science and Technology Transfer (IORA-RCSTT)**

**Professor Mottaghy,**

**Professor Tulba, Dean of Research, Medical Faculty,**

**My dear fellow researchers and experts,**

It is a great pleasure and honor for me to speak at opening segment of this workshop on Biomedical-Engineering and other Innovative Technologies with Relevance for Post-Disaster Situations and welcome all participants.

This workshop is the result of the interaction between the two fields of science and technology on the one hand and crisis management on the other, which have evolved together and tried to tap each other's capacities with a view to addressing difficult situations. In this process, we try to help encouraging the productive and constructive collaboration among early responders in disaster situations and scientists from different countries to build their capacities towards more efficient and effective rescue and relief operations. We hope that this innovative interdisciplinary workshop can pave the way for more initiatives in terms of knowledge sharing and technology transfer at the service of people.

The world of science, technology and innovation is an exciting area in which to network and interact. We all continue to meet and bring inspired people together in forum like this to ensure that our organizations remains at the cutting edge. I am pleased to see participants from Bangladesh, Malaysia, Madagascar, Maldives, Mauritius, Seychelles, Sri Lanka, South Africa, Somalia and Tanzania are taking part in this workshop. Unfortunately, the two Iranian scientists who were planning to join us here were not able to receive their visas in time. I am very pleased that Professor Mottaghy and Dr. Krimmel are working to reschedule their visit to the relevant facilities and meet relevant people at Aachen University later in December.

In organizing this workshop, RCSTT, benefited enormously from the assistance and extensive efforts by Aachen university, coordinated by professor Mottaghy, from IORA Secretariat, coordinated by Ms. Daniëlla Smit, and Germany's GIZ, coordinated by Dr. Thomas Krimmel. The idea of this workshop was raised and discussed more than two years ago between RCSTT and Aachen University and gradually

gained momentum when the government of Germany agreed to generously support the program and GIZ on behalf of Germany stepped in. Thus, this workshop is the result of a fruitful cooperation between Germany as a IORA dialogue partner and IORA member states. I presented this idea at the 8th Bi-Annual Meeting of the Committee of Senior Officials (CSO) and 20 the meeting of CSO both in Durban, in 2018. I updated the 21st Meeting of the CSO, in Abu Dhabi, United Arab Emirates, which was held in Abu Dhabi, United Arab Emirates, on 5-6 November 2019.

Before I close, I should say that it is an honor and pleasure for RCSTT to help organize this event. It is indeed an exciting time for RCSTT, as an especial agency for science and technology transfer in the IORA region, to continue to grow and cover different issues in different regions. RCSTT pledges to remain always adaptable, motivated and responsive, relevant and open to new ideas. We believe Technology should provide early warning. It should alleviate the pain and help people dealing with different shocks and traumas of different man made or natural disasters.

And finally, throughout this workshop, I have no doubt that you will stay engaged and will work in a way to keep us always proactive.

Thank you very much.

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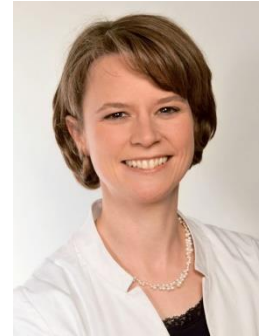
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### Session One:

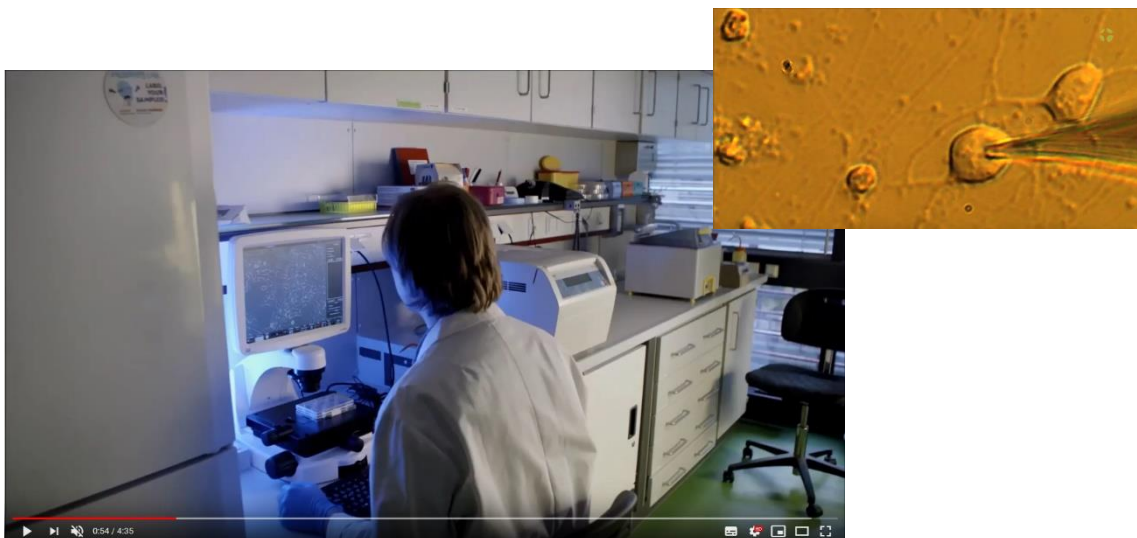
Pain: Molecular Basis & Clinical Picture

**Prof. Dr. med. Angelika Lampert**

“Pain is an unpleasant sensory and emotional experience associated with actual or potential tissue damage, or described in terms of such damage”: this definition by the International Association for the Study of Pain shows the broad complexity of pain, and that it is far too short-sighted to see pain as a mere bodily sensory function like e.g. touch. Pain affects the whole person and as such chronic pain has a severe impact on humans in their everyday life. Ongoing pain can result from damage to the nerves or the brain, but also from traumatic experiences, social deprivation or life changing events such as they may occur during disaster situations.



Pharmacological treatment of chronic pain, although in many cases not very effective, often target the function of peripheral nerves. Genetic pain syndromes originate from mutations and may present with a similar clinical picture as those occurring due to other reasons. This opens the possibility to study the potential mechanism underlying the somatic side of chronic pain. Especially the gene coding for voltage-gated sodium channels was recently put into focus, due to the discovery of patients who completely lack a specific subtype called Nav1.7. These patients do not experience pain and are therefore suffering from multiple injuries and have a reduced live expectancy. The lecture elucidated the role of sodium channels in somatic pain perception, the function of using induced pluripotent stem cells, and how this may help selected patients in the context of personalized medicine.



## Telemedicine Systems in Prehospital Setting

**PD, Dr. med. Jörg Christian Brokmann**

Demographic change, rising comorbidity and an increasing number of emergencies are the main challenges that emergency medical services (EMS) in several countries worldwide are facing. In order to improve quality in EMS, highly trained personnel and well-equipped ambulances are essential. However, several studies have shown a deficiency in qualified EMS physicians. Telemedicine emerges as a complementary system in EMS that may provide expertise and improve quality of medical treatment on the scene. Hence our aim was to develop a specific teleconsultation modular system.

In life-threatening emergency cases implementing an early and specific therapy is important to achieve the best possible clinical outcome. The so-called chain of survival is usually initiated by an emergency call. The sending of adequate resources by a local emergency dispatch centre is the next link in the chain. This is often rather challenging, since frequently little well-certified evidence is provided by the caller. To ensure high quality in emergency medical services (EMS), highly trained personnel and well-equipped ambulances are needed. They should arrive on the scene within a reasonable period of time, which is the next important link in the chain. The specified help period (goal time for arrival) for EMS in Germany ranges from eight (populous Hamburg) to 17 minutes (sparsely populated regions of Thuringia). These time periods are statutorily regulated at the federal and state level for the “first adequate vehicle” arriving at the scene which is normally equipped with a paramedic team; partially divergent demands are predefined for metropolitan and rural regions considering the varying population density and infrastructure, respectively.

Coincidentally, experience of medical staff in managing severely ill and severely injured patients is considerably lower in rural regions due to the far lower number of such emergency cases. However, quality depends on both formal qualification and experience. Consequently, in the mentioned regions, latency to the onset of therapy is typically higher and quality of all European countries including Germany, a dual system for emergency response with both EMS physicians and paramedics has been established; usually they are dispatched separately. Several studies have shown that at least critically ill patients benefit from treatment by an EMS physician, particularly in cases of cardiopulmonary resuscitation, advanced airway management, further invasive procedures, well-directed fluid management and early pharmacotherapy. In Germany, paramedics have restricted competencies in invasive procedures and intravenous medication, depending on local regulations. Since ambulance stations are more closely meshed than EMS physician locations, a time gap can occur in which paramedics have to wait for a doctor due to their restricted competencies. Depending on the characteristics of a particular case, time delay of treatment might prove disastrous.

The aim of the lecture was to highlight the telemedicine rescue assistance system in analyzing requirements for the use of telemedicine in EMS in terms of hardware, software and organizational issues, to develop a robust and reliable system fulfilling defined requests and, finally, to carry out preliminary performance in preparation for the future.

## Trauma Care in Germany

### Prof. Dr. med. Frank Hildebrand

According to the data of Germany's Federal Statistical Office, there were 396 018 accidents resulting in personal injury in Germany in 2018. 3 275 people were killed in road traffic accidents and the Trauma Registry DGU® by the German Trauma Society reports on 32 580 seriously injured patients. Following their accidents, these people require appropriate medical care. Germany has efficient hospitals that provide the various levels of care needed, but those with serious injuries should be treated in appropriate level one (highest standard) or level two (local or regional) trauma centers. The Department of Orthopaedic Trauma at the RWTH Aachen University Hospital is certified as a level one trauma center, serving severely injured patients from all over the local Euregio-Trauma-Network® but also internationally. Due to its localization close to the border also patients from Belgium and the Netherlands are frequently admitted and treatment requests for sub-urgent cases arrive from all over the world. Aside immediate trauma care following in emergency cases and intensive care medicine, the department also focuses on the long-lasting health problems of once severely injured patients. This happens in the most modern surrounding with exceptional technical support and equipment, highly qualified doctors and dedicated caregivers. To hold that high level of support, the department established a research unit focusing on the most recent problems in trauma care.

Beside biomechanical studies facing properties of internal and external stabilization devices in spine, extremity and pelvic surgery large data bases allow to seek for individual parameters in each patient to determine the postoperative outcome. In regard to the further clinical course, complications like multi organ dysfunction, systemic inflammatory response and sepsis are most feared. The lecture furthermore focussed on the complex analysis from a serum-data base which helps to determine molecular and genetic alterations that might help to predict the development of negative events and thus further improves patient outcome. Within the trauma setting, the study group does focus on the posttraumatic immunologic changes and pathways, but also possible diagnostic and therapeutic strategies are illuminated.

To support these scientific efforts, a unique large animal model of combined trauma was established to investigate hypothesis that cannot be proven in the human situation. However, this model is clinically most realistic and was awarded by national and international societies for its huge translational significance. With regularity new hypotheses are discussed and tested within that model which receives funding from prestigious institutions such as the AO and DFG (German Research Foundation).

## Session Two:

### Smart Textile Medical Solutions for Post-Disaster Situations

**Prof. h. c. (MGU) Dr.-Ing. Dipl.-Wirt. Ing. Thomas Gries**

The lecture focussed on innovative Medical Smart Textile Technologies which may be used in the event of a natural disaster to enable important functionalities for rescue services and patients. These smart textiles are systems that combine functional textile materials and integrated electronics into a wearable device for healthcare. They perceive and react to environmental influences such as thermal, chemical, electrical and magnetic changes and allow the monitoring of body functions and the support of vital functions. Along the textile production chain, a variety of technologies have been developed to integrate imperceptible and comfortable system components through conductive yarns, embroidery and functional printing.

Possible applications for medical Smart Textiles are textile sensors for measuring biosignals, pressure, humidity and temperature or textile actuators for heating elements and lighting systems. In communication technology, Smart Textiles can be applied in the form of textile antennas. Textile sensors such as textile electrodes integrated into a shirt can be used for real-time monitoring of vital functions of firefighters, in order to detect an overload of the body at an early stage and to ensure the safety of the person. Textile antennas for the transmission of GPS and mobile communication could be integrated into outer wear to determine the person's location in case of emergency. Textile Actuator could be used to care for avalanche victims through textile heating elements in blankets or clothing to prevent hypothermia.

Medical Smart Textile Technologies offer a broad range of possibilities that for highly integrated, body-near systems enabling health and safety.





## Disaster Preparedness for Infectious Diseases – The Significance of Drinking Water Safety

**Dr. med. Dr. rer. nat. Axel Hahn**

Regularly recurring natural disasters imply enormous challenges in disaster control and emergency management even for high developed countries. Beside acute health control the most important task in disaster control is the early prevention of epidemic plagues, especially when large-area incidences occur caused by earthquakes, floods, hurricanes etc.

Next to heavy acute traumas, within shortest time the absent of clean water increase an enormous hygienic human risk by the flooding the infrastructure of water service reservoirs, water supply wells, standpipes etc. These facilities could be damaged mechanically or often permanent by irreparable mud and sludge contamination. Especially in the developing world countries with simple standpipe constructions they had to be renewed completely and shifted to more appropriate places in case of disaster.

Biomedical challenges in flooding water disaster preparedness are first and foremost the rapid and complete supply of the effected human population with sufficient clean drinking water, since infectious diseases e.g. cholera, dysentery, other enteric fevers, hepatitis etc. often occur after short-time drinking of contaminated water. A high risk is known for toddlers, children, sick people and the elderly.

Beyond sophisticated public authorities' plans, the very first action in disaster preparedness must be a direct public alert by radio/TV and, if possible, also by modern digital-technology tools by internet and smart phone. There, most important message must be: Don't drink any unclean water, use only bottled water, ask the authorities.

In parallel the immediate technological challenge is the successive allocation of mobile water preparation, pumping fresh water and provide back-up facilities with road tankers. The German federal Agency known as THW (Technical Social Aid) was highlighted as an international unit with disaster- appropriated water purification plants. Operation examples was shown to participants during the lecture.

The lecture additionally included discussions on preventive measures such as vaccinations for communities, ensuring the goal for effective and sustainable medical protection of people in the area of conflict.

## Flood Events and the Role of Smart Sensor Technologies

### Prof. Dr.-Ing. Holger Schüttrumpf

The lecture delivered focussed on flood protection and flood prevention strategies, including the impact of mangrove protection for coastal areas. Furthermore, information on innovative early warning systems for dike monitoring were shared, including an overview of different research areas such as:

- Flood protection, Flood risk management
- Coastal engineering and Maritime waterway engineering
- Groundwater dynamics and Water well construction
- Reservoirs and Hydro power
- Nature-orientated hydraulic engineering and Eco hydraulics
- Sediment transport and Morphodynamics



IORA Participants had the opportunity to visit the Institute of Hydraulic Engineering and Water Recourses Management (IWW) after the lecture to learn more about the processes and strategies being developed in the field of Smart Sensor Technologies.

More information available at:

[www.iww.rwth-aachen.de/index.php?lang=en&cat=institute&sec=staff&sub=person&page=hschuettrumpf](http://www.iww.rwth-aachen.de/index.php?lang=en&cat=institute&sec=staff&sub=person&page=hschuettrumpf)

### Session Three:

Closed-Loop Control of Therapy in Post-Disaster Situations

**Prof. Dr. med. Dr.-Ing. Dr. h. c. K. Steffen Leonhardt**

Steffen Leonhardt holds the Chair of Medical Information Technology at RWTH Aachen. In 1987, he received an M.S. degree in computer engineering from the State University of New York at Buffalo, Buffalo, NY, USA. In 1995, he earned Dr.-Ing. degree (Ph.D.) in electrical engineering from the Technical University of Darmstadt, Darmstadt, Germany, and in 2000, he received the M.D. degree in Medicine from J. W. Goethe University, Frankfurt, Germany.



Dr. Leonhardt has almost five years of R&D management experience working for Dräger Medical AG & Company, KGaA., Lübeck, Germany, and was appointed Full Professor and Head of the Philips endowed Chair of Medical Information Technology at RWTH Aachen University, Aachen, Germany, in 2003.

In 2014, Dr. Leonhardt became a fellow of the NRW Academy of Sciences, Humanities and the Arts in Düsseldorf, Germany. In 2015, he was appointed a distinguished lecturer by the IEEE EMBS. He holds an honorary degree from CTU Prague (Dr. h. c., 2018) and has been appointed distinguished professor at IIT Madras, India, in 2018.

The lecture highlighted the research which the Chair of Medical Information Technology at RWTH Aachen conducts, and included measurement technology, instrumentation and signal processing in medicine; wearables and personal health care applications and closed-loop systems and automation of therapy.

The automation of therapy was discussed in the lecture with real-life examples. This specific area has a large impact for disaster medicine, as it allows to support more patients in times when the demand for assistance outweighs the available number of care givers.

## Seawater desalination: State of the Art and Novel Trends Dr.-Ing. Süleyman Yüce

Water is the most important element on the earth that makes it unique; namely a planet with life on it. Even though 2/3 of the world's surface area is covered by salty seas and oceans the freshwater scarcity is still an ever-growing problem in considerable large parts of the world. In the last few decades, the availability of freshwater in term of both, its quality and quantity has been significantly deteriorated by climate change and as well as it's negative side effects such as flood and drought. Furthermore, the water pollution by industrial and municipal use is one of the major factors limiting the freshwater availability in ever increasing rate.

In order to mitigate the negative impact of freshwater scarcity on the flora and fauna and consequently also on the human life, new water treatment technologies, particularly innovative desalination technologies are becoming more and more one of the main options making freshwater in the affected arid or flood regions in the world affordable. Both of the author's organisations:

1. Chemical Process Engineering (AVT.CVT) at RWTH Aachen University (senior researcher) and
2. STEP Consulting GmbH (managing director)

are traditionally dealing with the topics revolving around water treatment and desalination.

The lectured focused on the following steps:

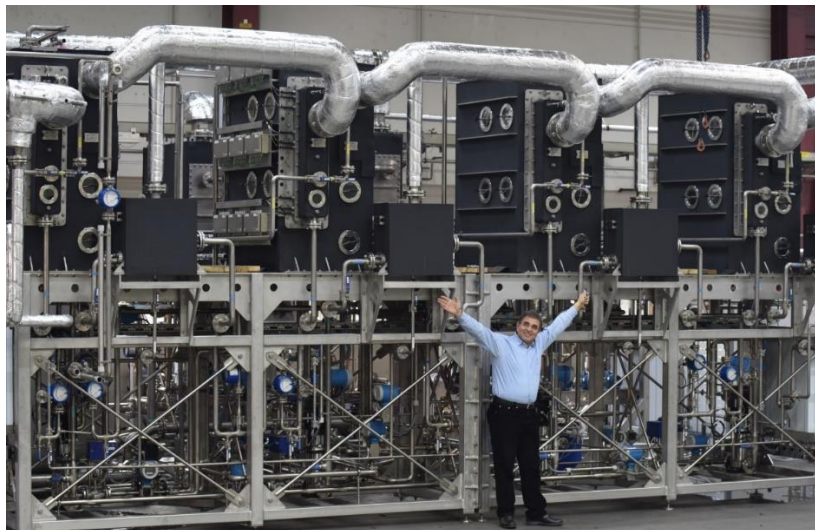
### 1. AVT.CVT:

The Chemical Process Engineering CVT, is one of the 7 departments within the AVT (Aachen Process Engineering). Water and wastewater treatment including desalination technologies are belonging to the traditional research fields of AVT.CVT. The desalination research history at CVT reaches back to the 1960ies, where the high importance of the growing demand on fresh water has been discovered and the first desalination plants at industrial level in MENA (Middle East North Africa) countries started their operation. During the following a few decades, both, thermal desalination MSF (Multi-Stage-Flash) and MED (Multi-Effect-Distillation) as well as membrane-based technologies such as UF (Ultrafiltration), NF (Nanofiltration) and RO (Reverse Osmosis) for seawater desalination were in the focus of the research projects of the CVT, enabling the direct comparison of their advantageous and disadvantages. In the last decade, the desalination and water treatment related research at AVT.CVT under Prof. Matthias Wessling is mainly covering the innovations in the fields of membrane-based technologies including research on membrane material, module design and process optimisation in combination with chemical, electro-chemical and adsorptive process technologies. AVT.CVT has an

impressive record of coordination of as well as participation in numerous international water projects, such as AQUAREC, RECLAIM WATER and MBR-TRAIN, TECHNEAU, EUROMBRA, Water4India, LbL-BRAIN, BRAMAR and SUPER-W among several others. In the frame of a Water4India projects AVT-CVT developed a new POU (Point of Use) system and investigated on other small-scale systems (SSS) that may be used also in case of flood disaster.

## 2. STEP

STEP Consulting GmbH is an independent engineering company based in Aachen dealing with “Sustainable Technologies for Energy and Processes”. As an SME (small and medium-sized Enterprise), STEP has been involving in the planning and implementation of process engineering and energy technology projects since 1996, mainly in the field of water, wastewater treatment and particularly in seawater desalination. Parallel to his involvement at the CVT, the author is the managing the director of STEP Consulting GmbH. This connection ensures a close connection from research to application. Thus, in recent years, STEP has participated in several international water treatment and desalination research projects, such as TRUST, Water4Crops. STEP has created also several patented novel concepts for sustainable desalination using renewable energies. Bridging theory and praxis and using the synergies between them, STEP is developing pilot plans for innovative research activities in the field of desalination. These high sophisticated pilot plants are necessary to develop more sustainable processes with high energy efficiency and more reliable operation beyond the state of the art. The figure 1 shows one of the pilot plants that is recently developed, designed and engineered by STEP for a desalination research center in the Middle East.



*Figure 1. A large-scale pilot plant for R&D purposes in the field of thermal desalination, recently developed, designed, engineered and commissioned by STEP Consulting*

The presentation furthermore provided a review on the history of the destination research at CVT performance results from selected earlier research projects and ongoing research work dealing with water treatment and desalination. In connection with this, the state-of-the-art desalination as well as drinking water treatment was shortly summarized, including novel trends to innovative technologies to meet future challenges. As an example, one of the novel desalination research topics, FCDI (flow-electrode capacitive deionisation) was explained in detail and the recent developments made for FCDI technology. Additionally, some innovative concepts and patented ideas created by STEP for more sustainable desalination was presented.

## Revitalization of Fukushima Prefecture and Challenges of Creating New Industries

### **Dr. Katsuyuki Endo**

The lecture focussed on how Fukushima's prefecture was handling the large number of evacuees and the reconstruction of areas after the triple disaster of 11 March 2011. Emphasis was drawn to the encouragement and the revitalization of the region by medical technology, as well as other futuristic innovative industries, such as robotics. Monitoring and inspection techniques for radioactive contaminants were highlighted as well as the Fukushima Medical Device Development Support Centre.

More information available at: [www.pref.fukushima.lg.jp/site/portal-english/en03-01.html](http://www.pref.fukushima.lg.jp/site/portal-english/en03-01.html)

## A Novel Antioxidant Dialysis Treatment and a New Small Portable X-Ray Tube

### **Mr. Hidetoshi Nakajima**

“Running water is always fresh” says a proverb. The usage of ceramic for gas filter elements is PURERON's originality, and great breakthrough in fluid purifying technology. PURERON first started to challenge conventional technology in 1985. “Technology” is a genre where the latest, most flexible idea is always in high demand. At PURERON we are always running with the vigour of the young toward technical innovation from a humanistic and global point of view.

The lecture highlighted PURERON's Hydrogen Water Monitoring System (HWMS) attempts to revolutionize Haemodialysis by delivering hydrogen gas (H<sub>2</sub>) enriched dialysate to patients. The objective of this concept is to improve the quality of life (QOL) for Haemodialysis patient by reducing the oxidative stress and the inflammation caused by haemodialysis therapy.

Focus was additionally drawn to the all-new portable X-ray tubes which is specially designed with the Japanese disasters of 2011 in mind. As highlighted, a small portable X-ray tube, will be a life-saving instrument in the hands of Rescue Services around the world, when facing large-scale catastrophes. Furthermore, such a device could easily find its way around ambulances, helicopters and other mobile rescue units, as a quick diagnostic tool for everyday applications, such as the on-site evaluation of the patient's condition.

More information available at: <http://www.pureron.co.jp/english/index.html>

### Telemedicine and Telehealth in Disaster Management: Italian Projects

**Dr. Eng. Claudio De Lazzari - Domenico Massimo Pisanelli**

Telemedicine is the practice of medicine using technology to deliver care at a distance. A physician in one location uses a telecommunications infrastructure to deliver care to a patient at a distant site.

On the other hand, Telehealth refers broadly to electronic and telecommunications technologies and services used to provide care and services at-a-distance healthcare delivery and services. Telehealth technologies and tactics support virtual medical, health and education services.

The two disciplines are similar, but Telehealth differs from Telemedicine in that it refers to a broader scope of remote health care services than Telemedicine. Whereas Telemedicine refers specifically to remote clinical services, Telehealth can refer to remote non-clinical services such as provider training, continuing medical education or public health education, administrative meetings, and electronic information sharing to facilitate and support assessment, diagnosis, consultation, treatment, education, and care management.

Research shows that Telemedicine is one of the best solutions to help victims in disaster and remote areas and where there is shortage of specialist. It can be used in disasters and the delayed treatment areas as well as for training first receivers to collaborate with specialists in remote locations to triage and treat seriously injured victims.

In a scenario of emergency Health, the problems that medical personnel must face are different and heterogeneous: a certain identification of the patient; make the patient quickly locatable by the same staff; make general information about the status of the patient available to the medical staff of structure destination; make the same information available in real time to a coordination center that can thus assign the proper priority to the interventions.

The lecture highlighted the first application of wireless Telemedicine in disaster was provided by NASA (National Air and Space Administration) in the 1985 Mexico City earthquake that it had destroyed all terrestrial telecommunications infrastructure. Using Advanced Communications Satellite (ATS-3) it was possible to establish audio transfer for international rescue organizations.

During the earthquake in Armenia (1988), the international satellite communications between different countries, including Russia and the U.S.A. was set up and was called the space bridge. Several regional hospitals and four medical centers in the U.S. were established to exchange information and provide clinical consultations.

In 1996, the US Department of Defence established a medical network serving troops in Bosnia and other countries. The Telemedicine segment was designed to help military physicians communicate with each other using real-time voice and video for consultation and diagnosis.

The Great East Japan Earthquake and Tsunami (GEJET) in Tohoku, Japan caused total collapse of 11 hospitals and partial collapse of more than 200 in three prefectures (Iwate, Miyagi, and Fukushima). The loss of hospital facilities highlights the enormous investments needed for disaster preparedness.

As for Italy, focus was drawn to the Earthquake of L'Aquila (2009) which caused the partial collapse of San Salvatore hospital. Many patients were placed outside the many buildings that made up the hospital. San Salvatore hospital was declared unfit for use by 90%. In Italy, many proposals have been made in projects not only specifically aimed at employing Telemedicine in the management of catastrophic events.

One of these projects is SERIT: the Italian Technological Platform (started in 2007), jointly launched by the National Research Council - CNR and Finmeccanica/Leonardo. SERIT engages Italian industries together with academia, research centers, national stakeholders and end-users, in order to develop and promote a National Research Agenda driving the future technological developments, while answering to a list of National Security needs.

MiTAKA is another example of such a project and initiative. It is a computerized system of operational support for emergency medical aid for the Military Rescuer and health personnel, based on specific guidelines verified by the Training Department of the Army School of Health and Veterinary, in compliance with the protocols operating forces.

The application, made for tablets, has the following features:

- Assignment of a unique alphanumeric code, generated directly by the application, for the identification of patients which, applied on the Triage cards used by the rescue team, allows



precise control of the patient's position from his first aid to the final destination, within the evacuation chain and health treatment.

- Flow chart for the victim's triage operations to the military rescuer, designed according to NATO algorithms and with the possibility of collecting information to be made available in real time to each member of the rescue team.
- Integration and exchange of data in real time with the server. Exchange of information such as the equipment necessary to facilitate evacuation operations medical.
- Visualization in specific updatable cards of every patient rescue on the field, for a more effective use of the available resources and for reserving more in-depth clinical controls for critically ill patients, in dedicated areas.
- Possibility of connection to the internet for transmission of all data remotely.

However, as highlighted in the presentation, some initiatives have been carried out in Italy, but no general-purpose/national project for the use of Telemedicine and Telehealth in disaster management have been funded. A research on the internet (Italian keywords: "Telemedicina", "Disastro", "Catastrofe", "Terremoto", "Alluvione", i.e.: "Telemedicine", "Disaster", "Catastrophe", "Earthquake", "Flood") confirms this negative finding.

#### Session Four:

Increasing numbers of EMS Calls - what is the Response of International EMS Services

**Prof. Dr. med. Dr. rer. nat. Alex Lechleuthner**

The lecture focused on the organization and special research of rescue services. Worldwide, the numbers of emergency services are increasing. This raises the question of how the responsible institutions and authorities can react. First, it is to analyze how the requests for help, which are received via the emergency number (in Germany 112) are composed. From this it must be determined which help offer is suitable and necessary for each request for assistance; This applies in particular to the time of arrival to the patient, since every minute "less" requires considerable structural, material and human resources. As far as the existing resources are not suitable, this appropriate means would have to be procured if necessary. As a result, one should come to a scalable rescue system that meets the requirements and is economically viable.

## Innovative Concepts in Organ Transport

**Prof. René H. Tolba**

The aim of the talk was to demonstrate best practice examples for translation in surgical research, from the idea to a medical device for bipolar vessel sealing, and for kidney and pancreas preservation and a new organ preservation solution for cold storage and machine preservation.

The first example was the development of a bipolar surgical device for vessel and tissue sealing (EnSeal). The device was tested as prototype and then further developed. Finally, the instrument was registered as medical device (class 3). Secondly, attention was drawn to show the development and in vivo biosafety testing of a new multi organ preservation solution named ECOSOL. Prof. Tolba mentioned how they tested the solution in liver and kidney preservation as well in combination with oxygenated storage. "We developed also a machine, the ECOFLOW, for the oxygenated storage of kidney or pancreas grafts for transplantation". Finally, he demonstrated the ability of the Venous systemic oxygen persufflation technique for the improved preservation of liver and kidney grafts for transplantation. This technique, developed in Cologne, Germany by Isselhard and Minor, was thereafter tested in Bonn and Aachen and finally tested in a clinical trial in Essen Germany. It is an elegant technique for the expansion of the donor pool to transplant more livers and kidneys in a safe manner.



## Innovative Approaches in Training and Teaching Concerning Patient Safety

**Dr. med., SpR Sasa Sopka**

Aachener interdisciplinary Trainingcenter for Medical Education and Patient Safety – AIXTRA serves as a high-tech Competency Center for Training and Patient Safety. More than 2500 under- and postgraduate students are trained in clinical competencies. It offers all the aspects of a simulated hospital with innovative training approaches and technology. AIXTRA is probably one of the most innovative and most developed training- and simulation centers in Europe.

The presentation focussed on communication errors and miscommunication that cause clinical incidents, adverse events and serious medical errors. To ensure proper patient care, it is essential that medical handovers are efficient and provide physicians with detailed, necessary information. Therefore, Education and Training of Patient Safety Aspects is essential in the professional World of Healthcare providers. The presentation explained innovative methods and approaches how to train healthcare providers in Patient Safety Aspects like professional communication, structured protocols

and handovers, Safe Medication and improving professional processes in patient care. Especially in areas with inferior infrastructure or higher disaster incidence, medicine training (of patient safety aspects) and education is crucial.

## Innovative Systems for Cardiopulmonary Devices: Biohybrid Approach for a New Generation of Cardiovascular Devices

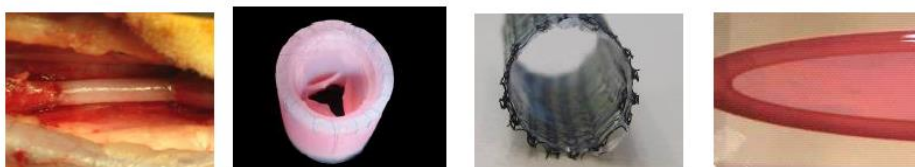
**Prof. Dr. med. Dipl.-Ing. Thomas Schmitz-Rode**

The lecture highlighted the contemporary cardiovascular devices and implants (vascular prostheses, stents, patches, valves) and lung support systems (ECMO - Extracorporeal Membrane Oxygenators, ECCO<sub>2</sub>R – Extracorporeal CO<sub>2</sub> Removal) which have limited hemocompatibility, tissue biocompatibility, and biomechanical compliance. A novel concept of patient customization of cardiovascular and cardiopulmonary devices utilizes a biomimetic approach. In order to create “biohybrid” (combined technical-biological) systems, textile polymer scaffolds and polymer membranes were coated by autologous cells. “Autologous” means that the cell donor will be also the recipient of the implant, indicating a concept, which is strictly limited to an individual patient. Cell cultivation and cell seeding to technical matrices is followed by a phase of conditioning in bioreactor systems with increasing flow and pressure rates up to physiological levels. Vitality and integrity of tissue structure and cell lining were assessed and discussed during the lecture.

### Focus: Research on Cardiovascular Implants



### Technical Solutions: Blood Pumps, Oxygenators, Heart Valves, Testing Systems



### Biological Approach: Vascular Grafts , Heart Valves, Stents, Patches

**Biohybrid Vascular Graft**



Day 0



Tissue Eng. Vascular Graft

**VS.**

GoreTex™ Vascular Graft



After  
6 month



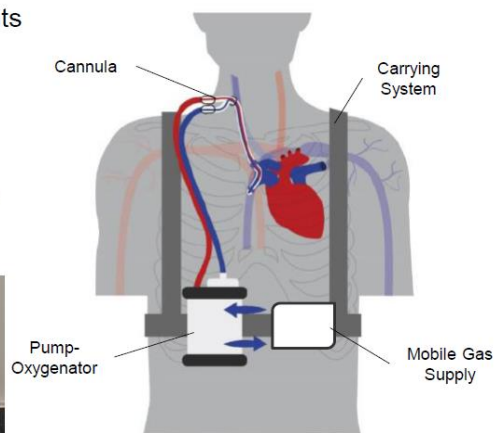
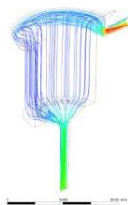
Such a biofabrication process of autologous cell lining and tissue growth based on textile polymer scaffolds could be established for vascular grafts, stents and valves, using an injection molding technique of autologous fibrin gel with myofibroblasts, endothelial cell seeding and subsequent bioreactor conditioning. In vitro results and animal experimental studies was presented to participants as well during the lecture. Preliminary results are encouraging as highlighted by Prof. Schmitz-Rode. However, further efforts are to be made to standardize tissue maturation in the biofabrication process and to optimize instrumentation in image guided delivery of biohybrid cardiovascular devices and vascular connection of cardiopulmonary support systems.

**Oxygenator Projects**



**Wearable ECMO-System  
for Lung Transplant Patients**

- For ECMO & ECCO<sub>2</sub>R
- ≤ 3 kg weight in ECCO<sub>2</sub>R mode
- Docking station for connection to ICU devices



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**IORA Workshop on  
Biomedical-engineering and other Innovative Technologies  
with relevance for  
Post-Disaster Situations**

18 – 21 November 2019,

RWTH Aachen University, Germany

Dear Participant,

We trust you were able to gain valuable insights during the lectures held to date here in the beautiful city of Aachen!

The Indian Ocean Rim Association (IORA) Core Group for Disaster Risk Management (DRM) is currently in the process of finalizing the regional Indian Ocean DRM Work Plan to strengthen collaboration between Member States for the prosperity and peace of the region. The need to enhance capacity and regional collaboration is of utmost importance and IORA provides an ideal platform for us to share our knowledge, best practices and experiences.

As our distinguished experts, we kindly request your recommendations and inputs to formulate an outcome document for this Workshop, which may be included to the draft regional Work Plan. This draft Work Plan was formulated by IORA Member State Disaster Risk Management experts in February 2019. It is to be noted that the Republic of India, as the current Lead Coordinator for the IORA Core Group, would be finalizing the draft regional Work Plan in the beginning of 2020.

In view of the above, we kindly request you to please provide 5 – 10 practicable and actionable recommendations, as per your field of experience in Disaster Risk Management within your Country, which may be added to the IORA Disaster Risk Management Work Plan.

As per the objectives of this Workshop, your recommendations to enhance our regional collaboration initiatives may include areas related to post-disaster situations, such as salt-water desalination and water purification, as well as safe sanitation solutions, and search and rescue programmes among others.

Please see below questions which may serve as a guideline to provide recommendations (Annex 1).

Thank you.

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**Annex 1**

**RECOMMENDATIONS GUIDELINE:**

Once a disaster has hit an area, rescue teams fight against time to provide relief and to save the lives of sometimes badly injured survivors. Appropriate medical knowledge and expertise is scarce and can often not arrive in time to provide relief measures in sufficient quantity to urgently assist affected and devastated areas. As a subsequent impact of such a disaster, drinking water and safe sanitation solutions are in short supply, and threaten communities to be affected through the spread of communicable diseases and other disaster threats.

There are a number of technology solutions that can assist to reduce and contain these risks. It is important that the respective rescue teams and their backoffice supporters from various disaster risk management agencies of IORA Member States understand these technologies and gain access to the various solutions available.

1. What does your country require to strengthen DRM strategies/capabilities?;
2. Which platforms/agencies/Organisations may be involved to enhance cooperation between Member States?;
3. Which training is required to strengthen DRM?;
4. Which agreements may be utilized to enhance regional collaborations?;
5. Can your country provide DRM training, if yes, which training programmes?;
6. Which International Agencies are required to assist and enhance regional collaboration?;
7. Which International agreements are a necessity for DRM?;
8. Which information platforms/centres of excellence may be utilized to share DRM information?;
9. Which DRM information is required to be shared between countries bordering the Indian Ocean?;
10. Which innovative technologies are required to improve your DRM approach?;
11. Does your country participate in regional exercises, if yes, which regional exercise?;
12. How can IORA promote cooperation between various DRM stakeholders?; and
13. What does your country require to enhance DRM approaches?

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Annexure 6: Workshop Programme

**Workshop Programme**

**Monday, 18. November 2019**

**Session 1 - Venue Centre Charlemagne**

|               |   |   |
|---------------|---|---|
| 08:20         | <i>Departure from Hotel am Marschiertor</i> |   |
| 09:00         | <b>K. Mottaghy</b>                          | <b>Opening ceremony</b>   |
| 09:15         | <b>R. Tolba</b>                             | <b>Welcome address by the<br/>Dean of Research, Medical Faculty</b> |
| 09:30         | <b>T. Miremadi</b>                          | <b>Welcome address by the<br/>Director of IORA RCSTT</b>            |
| 09:45         | <b>A. Lampert</b>                           | <b>Pain: molecular basis &amp; clinical picture</b>                 |
| 10:30 - 11:00 | <i>Coffee break</i>                         |   |
| 11:00         | <b>J. C. Brokmann</b>                       | <b>Telemedicine systems in prehospital setting</b>                  |
| 11:45         | <b>F. Hildebrand</b>                        | <b>Trauma Care in Germany</b>                                       |
| 12:30 - 14:00 | <i>Lunch break</i>                          |   |

**Session 2 - Venue ITA**

|               |  |  |
|---------------|--|--|
| 14:30         | <b>T. Gries</b>                            | <b>Smart textile medical solutions<br/>for Post-Disaster Situations</b>                                  |
| 15:00 - 16:00 | <i>Visit to ITA<br/>&amp; Coffee break</i> |  |
|               |  | <i>Institute of Textile Technology</i>   |
| 16:00         | <b>A. Hahn</b>                             | <b>Disaster preparedness for infectious diseases – The<br/>significance of the drinking water safety</b> |
| 16:30         | <b>H. Schüttrumpf</b>                      | <b>Flood events and the role of smart sensor technologies</b>  |
| 17:15 - 18:15 | <i>Visit to IWW</i>                        |  |
|               |  | <i>Institute of Hydraulic Engineering<br/>and Water Resources Management</i>                             |
| 18:30         | <i>Dinner at "Auf der Horn" Restaurant</i> |  |

## Tuesday, 19. November 2019

### Session 3 - Venue AGIT

|               |   |   |
|---------------|---|---|
| 08:20         | <i>Departure from Hotel am Marschiertor</i> |   |
| 09:00         | <b>S. Leonhardt</b>                         | <b>Closed-loop control of therapy in post-disaster situations</b>                       |
| 09:45         | <b>S. Yüce</b>                              | <b>Sea water desalination: State of the art and novel trends</b>                        |
| 10:30 - 11:00 | <i>Coffee break</i>                         |   |
| 11:00         | <b>K. Endo</b>                              | <b>Revitalization of Fukushima Prefecture and challenges of creating new industries</b> |
| 11:30         | <b>H. Nakajima</b>                          | <b>A novel antioxidant dialysis treatment and a new small portable X-ray tube</b>       |
| 12:00         | <b>C. De Lazzari</b>                        | <b>Telemedicine and telehealth in disaster management: Italian projects</b>             |
| 12:45 - 14:00 | <i>Lunch break</i>                          |   |

### Session 4 - Venue AGIT

|               |  |   |
|---------------|--|---|
| 14:00         | <b>A. Lechleuthner</b>                                       | <b>Increasing numbers of EMS Calls - what is the response of international EMS services</b> |
| 14:45         | <b>R. Tolba</b>  | <b>Innovative concepts in organ transport</b>   |
| 15:30         | <b>S. Sopka</b>  | <b>Innovative approaches in training and teaching concerning patient safety</b>             |
| 16:00 - 16:30 | <i>Coffee break</i>  |   |
| 16:30         | <b>T. Schmitz-Rode</b>                                       | <b>Innovative systems for cardiopulmonary devices</b>                                       |
| 17:15         | <b>K. Mottaghy</b>   | <b>Closing remarks</b>  |
| 18:30         | <i>Dinner at "Magellan" Restaurant in Aachen city center</i> |   |



## Wednesday, 20. November 2019

### Visit to MEDICA - COMPAMED Exhibition Dusseldorf

09:30 *Departure from Hotel am Marschiertor*

17:30 *Departure from Medica*

**MEDICA** is the world's largest medical trade fair in the world, with more than 5,100 exhibitors from 70 countries in 17 halls. Leading individuals from the fields of business, research, and politics grace this top-class event with their presence each year.

[www.medica-tradefair.com](http://www.medica-tradefair.com)

**COMPAMED** is the world's leading platform for state-of-the-art medical technology. Innovative materials are as much of a focal point as pioneering components and new services. In recent years, COMPAMED has developed into a global hotspot for complex high-tech solutions in micro- and nanotechnology.

[www.compamed-tradefair.com](http://www.compamed-tradefair.com)

## Thursday, 21. November 2019

### Session 5 - Venue Hotel am Marschiertor

08:30 – 11:00 Prof. K. Mottaghy Round table discussion - Conference Hall

11:00 – 11:10 IORA RCSTT, GIZ, Concluding Remarks  
IORA Secretariat

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The IORA Workshop on Biomedical-engineering and other Innovative Technologies with relevance to Post-Disaster Situations was held in Aachen from 18 – 21 November 2019 in Germany.

The Indian Ocean Rim Association (IORA) Member States, located within and around the Indian Ocean rim, are prone to natural disasters such as earthquakes, tsunamis, typhoons, floods, droughts, and volcanic eruptions. As a result of climate change, extreme weather phenomena with the accompanying natural hazards are on the rise, alongside man-made hazards such as oil spills, and water, sea and air pollution. These effects are rising in frequency, with increasingly devastating results for our natural environment and alarming prospects of future generations.

While early warning and precautionary measures are vital to reduce the risks for damages and losses of life associated with these hazards, relief operations and rescue services are also important to help contain the damages to public infrastructure, private properties, and human lives.

It is with a view to these aspects, that the Dept. of Physiology, RWTH Aachen University, IORA Regional Centre for Science and Technology Transfer (IORA-RCSTT), with the support of Germany as a Dialogue Partner, through GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit) and the IORA Secretariat, initiated the IORA Workshop on Biomedical-engineering and other Innovative Technologies with relevance to Post-Disaster Situations in Aachen from 18 – 21 November 2019 in Germany.

The Workshop welcomed Disaster Risk Management (DRM) participants from 11 IORA Member States (Bangladesh, Iran, Madagascar, Malaysia, Maldives, Mauritius, Seychelles, Somalia, South Africa, Sri Lanka and Tanzania). Though-provoking presentations by experts and professionals from German, Japanese, Italian and Iranian research and engineering institutions, universities, and bio-medical

practitioners, were held on 18 – 19 November 2019. The Lectures covered a broad range of topics related to post disaster situations, including advanced biomedical engineering, telemedicine systems, air aid emergency, safe sanitation solutions and sea water desalination among other.

During the opening ceremony, Prof. Dr. K. Mottaghy Dept. of the Physiology, Medical Faculty, RWTH Aachen University, mentioned that “this workshop is very important for us to develop key recommendations with relevance to post-disaster situations for IORA and we are thankful to our invited experts from various fields to provide valuable insights”.

Furthermore, Dr. Miremadi from the IORA-RCSTT stressed that “The world of science, technology and innovation is an exciting area in which to network and interact. We all continue to meet and bring inspired people together in forums like this to ensure that IORA remains at the cutting edge.”

This Workshop provided participants an opportunity to gain experience and knowledge to advance technologies and strategies within the Indian Ocean region which may be used to effectively reduce fatalities and to aid victims affected by disasters.

On 21 November, participants had the opportunity to share their respective country strategies at a round table discussion and developed specific and actionable recommendations to strengthen regional collaboration for post-disaster situations.

Key recommendations developed, included some of the following to:

1. Collate an IORA disaster risk map and needs assessment;
2. Organise the sharing of disaster mitigation and response techniques by the IORA-RCSTT in collaboration with the IORA Core Group on DRM (CGDRM);
3. Promote the delivery of training, exchange and capacity building programmes by Member States and Dialogue Partners in the area of DRM; and
4. Enhance DRM awareness, especially in post-disaster situations, through education, media platforms and simulation exercises.

Participants also had the opportunity to visit the Institute of Hydraulic Engineering and Water Resources Management (IWW), the Institute of Textile Technology (ITA) and the MEDICA – COMPAMED Exhibition in Dusseldorf, which is the world’s largest medical trade fair with more than 5,100 exhibitors from 70 countries.

Building on the momentum and vision of the IORA Action Plan (2017-2021), this Workshop provided Member States with innovative solutions to develop effective strategies, locally and regionally, for post-disaster situations. The Workshop is reflective of the evolving activities of the Association, especially in the field of DRM as an ever-increasing area of concern. The IORA-RCSTT, GIZ and IORA Secretariat look forward to strengthening collaboration and capacity building initiatives within this important area.

**IORA Secretariat**

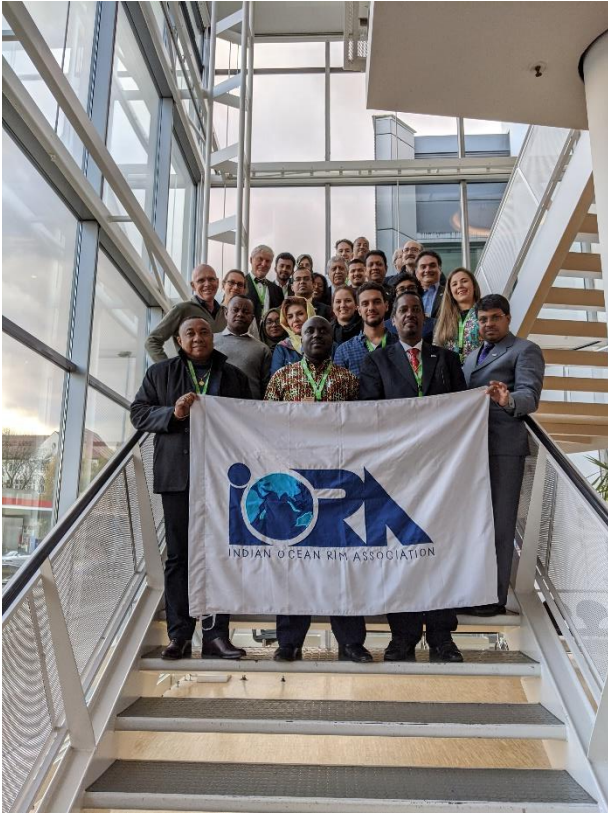
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*Official Workshop Backdrop*



*Participant Group Picture at the Aachener Gesellschaft für Innovation und Technologietransfer (AGIT) Lecture Hall*



Round Table Discussion on 21 November 2019



*IORA Participants at the MEDICA and COMPAMED Exhibition in Dusseldorf*



*Participant Registration and Wooden Badges for the  
IORA Workshop Green Culture*



*Visit to the Aachen Cathedral*