

# IGCS BULLETIN

## *From the Editors' Desk*



Dear Reader,  
IGCS is entering into a phase of consolidation after a near- three year period of evolution. The journey so far has been a satisfactory one. The period has seen the deputation of four visiting professors at IGCS in the areas of Water, Waste, Land Use and Energy, exchange of scientists and students, organisation of periodic Schools on different topics, and seminars. Dr.Christoph Woiwode has joined the IGCS as a short-term visiting faculty in September 2013 in the area of Land Use and Urban Planning. The IGCS-DST research projects are poised to take off and we hope that IGCS will be more visible in the Climate Research sphere.

The featured article for this issue titled: "Food Waste— how much and how to prevent?- The situation in Germany" is contributed by Prof M. Kranert and his colleagues: J.Barabosz and G. Hafner at the Institute for Sanitary Engineering, Water Quality and Solid

Waste Management (ISWA), University of Stuttgart. The article is very informative, thought provoking and enlightening on the issue of Food Waste. The authors have brought out the importance of food value chain in the context of Germany and the conclusions seem to be relevant even in the Indian scenario. We feel the article is timely, coinciding with the Indian Government's launching of an ambitious programme of National Food Security Act 2013.

We hope the readers will provide us with suggestions and technical articles to improve the content and quality of the Bulletin.

Thanking You.

Ajit Kumar Kolar and P. Sasidhar  
Editors

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Prof. Ajit Kumar Kolar

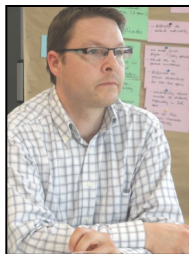


Dr. P. Sasidhar

## IGCS NEWS

### Dr. Christoph Woiwode joins IGCS

Dr. Christoph Woiwode joined IGCS as Short-Term Visiting Professor at IIT Madras in September 2013. Prior to this, he was working as a lecturer at the International Spatial Planning Centre, Technical University Dortmund, in Germany. Christoph holds a PhD in Planning Studies from the Development Planning Unit, University of London, after graduating in urban and regional planning (TU Berlin) and social anthropology (FU Berlin).



Christoph specialises in urban development with a regional focus on India/South Asia. His expertise in this field ranges from working as a long-term planning advisor with the German GTZ in Sri Lanka to extensive field research in India covering topics such as planning theories, urban governance and government reforms, poverty, inequality and slum development, climate change and disaster risk management, including dimensions of development such as culture and religion. More recently he began to explore the potentials of integrative, trans disciplinary and meta theoretical approaches to urban development theory and practice in the light of urban climatic change.

### Seminar Talk by Dr. Paul Wagner

Dr. Paul Wagner spent a four month period from June 2013 to September 2013 as a short term visiting scientist of the IGCS at IIT Madras working on modeling the land use change impacts on water resources in India. The objective was to study the effect of possible future developments in the Mula and Mutha River catchments in the Western Ghats upstream of the city of Pune. The findings from this study will contribute hydrologic insights to the ongoing debate in India on ecologically sensitive areas of the Western Ghats. On this project Dr. Wagner collaborated with Profs. Balaji Narasimhan, K. P. Sudheer and B.S. Murty from IIT Madras, Prof. Shamita Kumar and Mr. N. Lakshmi Kanthakumar from Bharati Vidyapeeth University, Pune, and Dr. Peter Fiener and Prof. Karl Schneider from the University of Cologne. He presented his findings in a seminar on September 24, 2013, which was attended by more than thirty faculty and students. Dr. Wagner also interacted with other faculty members of IIT Madras during his visit. He plans to get involved in a joint Indo-German project in future.



**Dr. Paul Wagner** (second from left) with his IGCS colleagues

### IGCS Seminar

Dr.Prof.Ralf Otterpohl from the Civil and Environmental Engineering department at the Hamburg University of Technology in Germany visited IGCS on 3<sup>rd</sup> September 2013 and interacted with the Centre Coordinator and Area Coordinators of IGCS. Later in the evening, he delivered the IGCS Seminar on: "Integrating Sanitation, Bio-waste, Energy and Agriculture: Terra Preta Soil Protection" in the Department of Civil Engineering, IIT Madras which was well received.

Dr. Prof Ralf Otterpohl has been the director of the Institute of Wastewater Management and Water Protection, which researches reuse-oriented sanitation concepts for both rural and urban contexts.

### IGCS – Bio Diva Programme

A 3-day National Level Dialogue on **"Cultivating Diversity"** was jointly organised during September 2<sup>nd</sup> - 4<sup>th</sup> 2013 at MSSR Foundation, Chennai by BioDiva and IGCS.



The workshop brought together experts, civil society and policy makers concerned about the sustainability aspects in land use change and its impact on ecological services and agro biodiversity. As a part of the above programme, a hand book titled "Cultivating Diversity" edited by A. Christnick and M. Padmanabhan was formally released at IITM, Chennai on 3<sup>rd</sup> September 2013 by Prof Sudhir Chella Rajan, Centre Coordinator, IGCS. A cultural programme followed the event.

### IGCS supports Climate Change conference

The Fourth National Research Conference on Climate Change, will be held at IIT-Madras, Chennai during October 26-27, 2013, with organisational and part financial support from IGCS-IITM.

The conference will be organized by IGCS-Indian Institute of Technology Madras, Indian Institute of Technology Delhi, Indian Institute of Science, Bangalore and Centre for Science and Environment, New Delhi under the banner of Indian Climate Research Network.

The conference will cover topics related to the scientific, technical, economic and policy aspects of climate change in South Asian countries, with a special emphasis on renewable energy. This event, the fourth in the series, intends to nurture and enhance a dedicated network of climate researchers. For details:

Website: <http://www.cseindia.org/node/4994>

### IGCS Energy Seminar

IGCS of IITM will organise a one-day Seminar on Energy in the first week of December, 2013. Several Indian and Germany energy experts will participate. For details, contact: Prof.Ajit Kolar, IGCS,IIT (kolar@iitm.ac.in) or Prof.F.Behrendt (frank.behrendt@tu-berlin.de).

### IGCS Winter School 2014

IGCS will organise the 2014 Winter School on "Sustainability in Theory and Practice" from 3<sup>rd</sup> to 16<sup>th</sup> March 2014 in IIT Madras. For details see the website: [www.igcs-chennai.org/](http://www.igcs-chennai.org/)

## IGCS Summer School 2013 – A great learning experience!

**Ms.Deepa Dinesh**

Tata Institute of Social Sciences, Mumbai, India.

The IGCS Summer School 2013 on "Integrated Approaches for Sustainable Waste and Water Management" was held from the 2<sup>nd</sup> to the 14<sup>th</sup> of July at the Department of Engineering Geology and Hydrogeology of the RWTH Aachen University. The Summer School coordinators at the Indo-German Centre for Sustainability (IGCS) welcomed the participants warmly and oriented us with the itinerary of the Summer School, RWTH Aachen University and the Department of Engineering

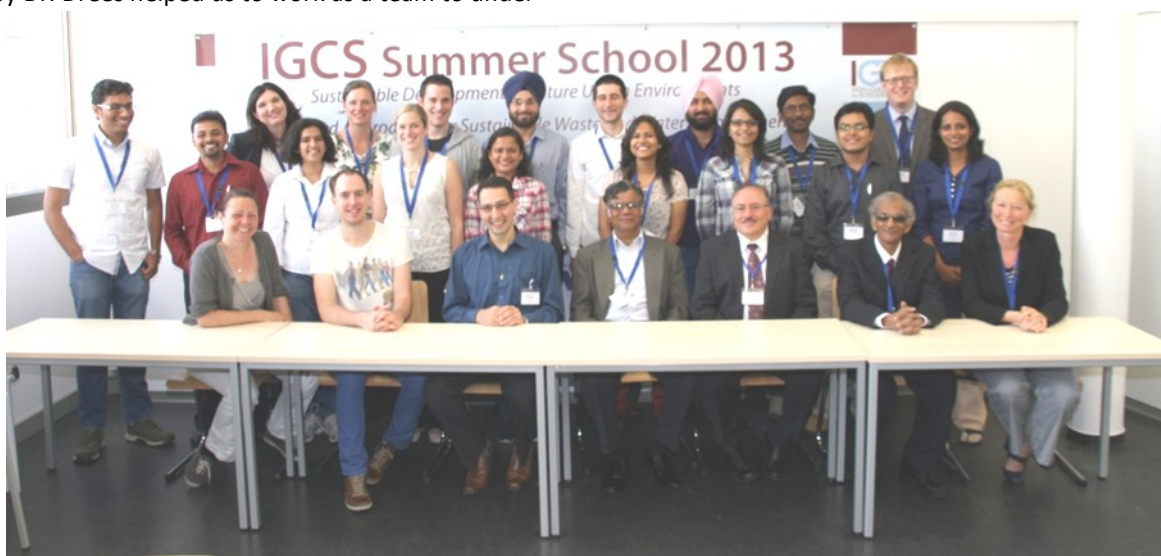
Geology and Hydrogeology. There were ten Indian participants and six German participants at the Summer School. The first day was eventful, with meeting and greeting the whole team and fellow participants. It was the first trip to Germany for most of us from India, but the organizers ensured that we had a pleasant and comfortable stay in Aachen, right from day 1. Some of the highlights of the first day of the Summer School were the guided tour to the magnificent Aachen Cathedral by

Professor Rafiq Azzam and meeting with the Deputy Mayor at the White Hall of the Aachen city Town Hall. We are thankful for the warm welcome that we received from everyone on the first day of the Summer School. Our experience from the first day impressed us greatly and increased our motivation to learn more about the water and waste management practices of the “City of Water” – Aachen.

The first week of the Summer School was interesting and informative, with lectures from professors and researchers from both India and Germany. Both the Indian and German students benefited from listening to the experiences of water and waste management in both countries. Since each one of us was from different educational backgrounds, we benefited greatly from our mutual interactions with students and lecturers from diverse backgrounds. The mini-project given by Dr. Drees helped us to work as a team to under-

stand the challenges in the sustainable development of two Indian cities, Mumbai and Leh. The group project was also an ice-breaker, as it gave the Indian and German students to work together in teams and exchange ideas. The mornings and afternoons were enlightening, with lectures and lab visits, and so were the evenings, when we walked around the city and learnt more about its history and culture. The trip to Cologne, organized by IGCS, on the 7<sup>th</sup> of July was a fantastic experience: we visited the Cologne Cathedral, watched the Christopher Street parade, shopped for souvenirs and sampled some Kolsch!

The second week of the Summer School complemented our lectures through field visits. We visited a compost plant, a waste incineration plant, two waste water treatment plants, a renaturation site, a dam and drinking water treatment plant and the Wurm River.



### IGCS Summer School 2013 Participants

The sixteen participants were divided into four groups of four members each. The groups were assigned the task of exploring more about the topics of: Drinking Water Management, Waste water, Waste and Water in urban/cultivated environment. The groups were formed keeping in mind the need for gender and international diversity. The group work and field visits have brought the Indian and German students together to learn and share their professional expertise and knowledge in different fields.

After participating in this eventful Summer School, we came back to India, carrying with us the warmth and affection of our German friends and colleagues and with the satisfaction of having made good friends and valuable professional contacts. On behalf of the Indian students, I would like to thank everyone in the IGCS team (both in Germany and India), the lecturers and the professors and research scholars at the department for their mentorship, help and support. ***Danke für alles!***



## FEATURE

### Food Waste – how much and how to prevent? - The situation in Germany -

M. Kranert, J. Barabosz, G. Hafner, Institute for Sanitary Engineering, Water Quality and Solid Waste Management (ISWA), University of Stuttgart

#### 1. Introduction

##### Background

The Food and Agriculture Organization of the United Nations (FAO) assumes that roughly one-third of the food produced globally for human consumption, or about 1.3 billion tonnes per year, is lost or wasted. At the same time, around 925 million people are suffering from hunger and malnutrition according to the FAO.

Throughout the value-added chain of foods (production, processing, transport, trade, and disposal), we draw upon natural resources and consume considerable amounts of them. These natural resources are wasted if food that has already been produced ends up not being consumed. This results in negative impacts on the environment (e.g. land use, eutrophication, adverse effects on biodiversity, CO<sub>2</sub> emissions, etc.).

In addition, it is both ethically and socially unacceptable not to make use of food. This widens the gap even further between prosperity and poverty, affluence and malnutrition and industrialised and developing countries.

Early 2012, the European Commission put the subject on the policy agenda and set the goal of curbing the amount of needless food waste by 50 percent EU-wide. In Germany, the Federal Consumer Protection Ministry also raised the issue of reducing food waste by launching the campaign "Each meal (time) is precious" with a view to enhancing the appreciation of food. The first study of its kind in Germany with the aim to estimate the quantities of food losses and wastage was finalized by the University of Stuttgart in 2012.

Based on the above mentioned study this article will illuminate the situation of the food value chain at the example of Germany.

#### Goals and terms of reference

The Institute for Sanitary Engineering, Water Quality and Waste Management (ISWA) at the University of Stuttgart investigated the quantities of food waste in Germany in the context of a study, elaborated for the German Federal Ministry of Food, Agriculture and Consumer Protection (Kranert, et al, 2012). One important aim of the study was to estimate the quantities of food waste generated in Germany on the basis of statistics, research, literature, surveys, expert consultations and specific studies on a random basis. Beyond that, proposals on how to reduce the amount of discarded food were developed. In doing so, the research team differentiated by food industry, wholesale and retail trade and consumers (large-scale consumers and households). An estimation of food waste in the farming sector involves a great deal of effort. It is investigated in separated studies and was therefore not covered in this research project.

#### Methods to estimate the amount of discarded food in Germany

The project comprises research into the data currently available and expert discussions, with an extensive analysis of data and literature on quantities, measures and initiatives and expert discussions in other EU countries and industrialised nations (e.g. USA, Australia). In addition own investigations to food waste from households and large-scale consumers have been performed.

#### Definitions and delineation of the field of investigation

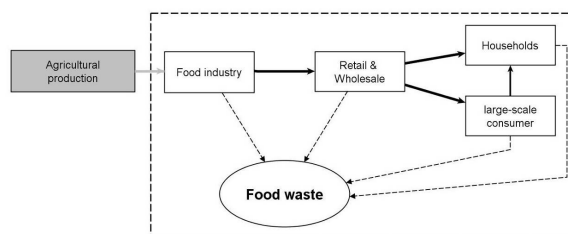


Figure 1: Areas of the value-added chain for food under examination

### Definition: food waste

The term food waste comprises leftover food from agricultural production, (further) processing of food, wholesale and retail trade, kitchens of large-scale consumers, private households and also raw and processed foods that are fit for consumption.

Food waste is further subdivided into

- Avoidable food waste: still fully fit for human consumption at the time of discarding or would have been edible if they had been eaten in time
- Partly avoidable food waste: generated because of different consumer habits (e.g. bread crusts, apple skins). This category also covers mixtures of avoidable and unavoidable waste (e.g. leftover food, canteen waste, etc.)

Unavoidable food waste: usually arises when food is being prepared and is discarded. This mainly encompasses both non-edible constituents (e.g. bones, banana peels) and edible ones (e.g. potato peels)

## 2. The quantities of discarded food in Germany - Results -

### Overview

Based on the research work including statistical calculation, the total amount is around 11 Mio. tonnes of food per year.

The percentage distribution of the calculated total amount is shown in Figure 2. One can see that of the analysed groups, households account for approximately two thirds of the amount of waste. The food industry and large-scale consumers each have a share of 17 percent. Compared with the other analysed groups, food waste from the trade sector accounts for only a small share of the total amount of waste (5 percent). One must keep in mind that large parts of this amount are given to charities.

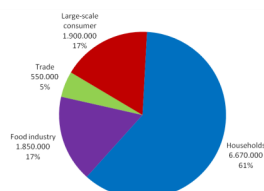
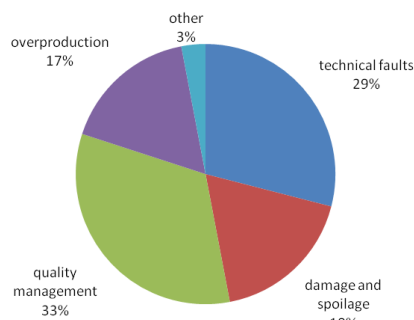


Figure 2: Distribution of food waste by value chain sectors for food (median) [t/a]

### Food industry

The median value of this projection is 1,850,000 tonnes per year. It should however be noted, that annually up to 12.5 million tonnes biogenic residues arise for further utilization.

Most enterprises surveyed stated that good and far-sighted operational planning should counter avoidable food waste caused by overproduction and bad planning (cf. Figure 3). Yet, it is nearly impossible to avoid food waste at this stage of the value-added chain. The demand for food is not always constant. Also, retained samples are stored for quality assurance. Their purpose is primarily to guarantee flawless and safe condition of products at least until their best-before date. These foods are then disposed of. Production losses



and faulty batches caused by technical problems constitute an additional source of waste.

Figure 3: Reasons for waste generation in the food industry

### Retail & Wholesale

The median value of this projection is 750,000 tonnes per year and exhibits the largest deviation to the fluctuation margin compared with other sectors.

A study conducted by the EHI Retail Institute GmbH shows that the German food retail trade is affected by a turnover loss of 1.1 percent per year in lost food, which corresponds to approx. 310,000 tonnes per year (EHI Retail Institute GmbH, 2011). This amount does not contain food given to charities. The true food losses in the retail sector are thus higher and amount to approximately 500,000 tonnes per year. It is undisputed that giving food to charities and food banks is a meaningful way to avoid waste that can possibly be intensified.

### Large-scale consumers

The median value of food waste in this sector (hotels, canteens, etc.) is around 1.900.000 tonnes/a.

According to Müller (1998), approximately 56 percent of food waste from large-scale consumers is avoidable and approximately 48.5 percent according to information provided by Baier and Reinhard (2007). When applying the more current value of 48.5 percent, 756,600 to 1,114,530 tonnes of food waste from large-scale consumers would be avoidable.

### Private households

In Germany an estimated 5.05 million tonnes of food waste is discarded via the municipal waste collection system each year. This corresponds to 62 kg/(E\*a) per capita. Approximately 70 percent of this amount is found in residual waste or in organic waste containers. It is also disposed of through other routes such as home-composting, feeding to pets or in the sewer system.

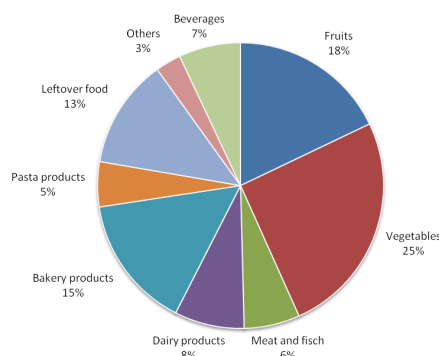
Taking the median value of this range in order to simplify, the annual amount of food waste is 6.7 tonnes or 81.6 kg/(E\*a) of which about three quarters (76 percent) enter the municipal waste collection system. As a result 47 percent of food waste is avoidable and that 18 percent is partially avoidable. This corresponds to 2.37 million tons or 29 kg/(E\*a) of avoidable food waste in the municipal collection system and 0.91 million tonnes or 11.1 kg/(E\*a) of partially avoidable food waste. The total amount is 3.14 million tonnes or 38.4 kg/(E\*a) of avoidable food waste and 1.2 million tonnes or 14.7 kg/(E\*a) of partially avoidable food waste.

Figure 4 displays household food waste broken down by its avoidability.



**Figure 4: Amount of food waste from households in Germany**

An approximate estimation on the composition of food waste for each product group have been carried out (on the basis of data by Cofresco [2011] and Barabosz [2011]). Figure 5 shows the composition of avoidable and partially avoidable food waste. Fruits and vegetables make up the largest share of avoidable and partially avoidable food waste.



**Figure 5: Composition of avoidable and partially avoidable food waste from households in Germany by product group (percentage by weight)**

The amount of avoidable and partially avoidable food waste from households in Germany corresponds to a monetary value of 16.6 to 21.6 billion EUR per year or approx. 200 to 260 EUR per capita and year. This means that avoidable and partially avoidable food waste accounts for between 10 and 14 percent of expenditures for food and non-alcoholic beverages.

### 3. Proposals for a minimization of food wastages

#### Strategies and concepts to reduce the amount of food discarded in other countries

Existing measures were identified with the help of the literature and Internet research, through scientific exchange and expert consultations, and by interviewing individual initiators of preventive measures.

A total of 360 preventive measures were identified on international level. These were classified, described and their results, if any, compiled. An assessment system (utility analysis) was developed in order to make preventive measures of the same category comparable.

The results show 34 promising approaches, which are described in detail in the long version of this project. Compiled as a best practice catalogue, it identifies specific options for action and recommendations to prevent food waste.

### Key Recommendations for action

Food waste should be permanently reduced at all stages of the food value-added chain. In the interest of sustainable consumption, the appreciation for food needs to be enhanced in large sections of the population. The recommendations for action provide food chain policy-makers, consumers, and stakeholders with reference points for decision-making when conceiving successful strategies for reducing food waste.

Drawing up a national roadmap represents a major step. First of all, objectives have to be articulated (*Free Roadmap to a resource-efficient Europe: halving food waste by 2020* (European Commission, 2011). The active involvement of all relevant stakeholders in the food chain (agriculture, industry, trade, households, restaurant and catering sector, policy-makers, educational establishments, social institutions, etc.) is needed in order to halve avoidable food waste by 2020. It is strongly recommended that round table talks will be held involving all relevant stakeholders in the value-added chain (FOOD SCP, 2009).

An exchange on innovative technologies and solutions, the most innovative collaborative activities of participating businesses will be conferred with an award. Furthermore, the participants will benefit from the reciprocal exchange of experience and from neutral advice (No Waste Network, 2011).

Platforms on more sustainability in the food chain are the key to coping with future challenges arising in the provision of food supplies (Foresight, 2011). Environment-friendly design of foods and greater transparency in the value-added chain will be realized (Verduurzaming Voedsel, 2009).

A database of best practice measures from the food chain, in the form of an open source, will enable the stakeholders to benefit from the experience gained from successfully implemented measures. In addition, such a portal can be used as an advertising medium for the enterprise's own projects and thus boost the image of the enterprise itself (Experiencebox, 2007).

Enterprises are called upon to take food waste into

account in their environmental management systems and to identify it in their environmental statements.

Initiatives as "United against waste" initiated by food companies, catering services, food service industry, hotels, retailers, intensify awareness raising and give solutions for the stakeholders as audits, trainings, workshops and tools.

In order to estimate and assess developments in the prevention of food waste and relevant action, constant collection of data or monitoring are essential. Based on scientific findings, these should be rapidly developed and introduced.

In spite of all the measures presented here, it will not be possible to completely prevent food waste. Depending on the suitability, food waste should be composted or used to produce renewable energy (biogas production). This is also enshrined in the new Closed Substance Cycle and Waste Management Act (KrWG) (Deutscher Bundestag, 2012), which will make the separate collection of biowaste mandatory as of 1 January 2015.

### 4. Closing Remarks

It is necessary to avoid food waste throughout the value chain. The cultivation and production of food is associated with a high use of fertilizers, water and energy. If foods are disposed of, this has significant ecological and economic impacts. These effects can be expressed with environmental parameters, for example greenhouse gas emissions and land use.

The research team at University of Stuttgart investigates continuously relevant international measures for the prevention of food losses. In addition, an evaluation and benchmarking tool has been developed, which enables the selection of appropriate measures for a specific region. Basing on this tool, a potential analysis towards an optimized food management system can be performed.

### Acknowledgement

The above mentioned study including described results were financially supported by the German Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) through the Federal Office for Agriculture and Food (BLE), grant number 2810HS033.



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