



Registration for the First Global TraPs World Conference Now Open

Global transdisciplinary discourses on sustainable phosphorus and nutrient management

Sustainable Phosphorus Management

Phosphorus is a potentially critical and irreplaceable nutrient required for crop and livestock production in a world where the population is projected to increase from the current 7 billion to more than 9 billion by 2050. It is also projected that during the same time period, food demand will increase by 70 percent based on current consumer preferences. This suggests that the absolute increase in food demand over the next 40 years will be equivalent to or slightly greater than the productivity increases experienced since the Green Revolution, but with the caveat that arable land and freshwater for agriculture are declining.

Additional considerations specific to phosphorus must also be considered as we face food security challenges and continued malnutrition in much of the world. First, the primary source of phosphorus (P) is phosphate rock, a finite resource. From a sustainability perspective, P requires increased efficiency of use and reduced rates of dissipation. Second, from an ecological point of view, P losses along the supply chain may cause severe pollution. Given that humans have almost tripled the natural phosphorus flows, P losses associated with untreated sewage, surface water runoff, soil erosion and leaching are major contributors to eutrophication and hypoxia in freshwater and coastal marine ecosystems. Finally, while in some parts of the world misuse is an issue, in other parts of the world (i.e. Sub-Saharan Africa); farmers do not have access to enough nutrients (including P) to grow crops to feed their families. For these farmers, insufficient use of P is resulting in soil nutrient depletion and land degradation.

Identifying consensus on the means of mitigating these phosphorus-specific issues is the foundation for Global TraPs. The first two years of the Global TraPs project have been unique. Scientists from many disciplines and key stakeholders from all nodes of the phosphorus supply chain have collaborated in order to identify options for improving and optimizing P management. Currently, P use shows relatively low recovery efficiency in most domains of the supply chain.

According to various reports by International Fertilizer Industry Association (IFA) or the Virtual Fertilizer Research Center (VFRC) (<http://bit.ly/15eIRFv>), as much as 40 to 50 percent of phosphorus is lost before processing. Similarly, there is poor efficiency after processing if one considers the phosphorus losses associated with human and animal waste.

Given this situation and the requirement for phosphorus to sustain life, four Global TraPs Workshops held in 2011 and 2012 (at which more than 100 scientists and practitioners took part) identified a guiding question (see text box) and a set of critical questions to address sustainable P management along the supply chain. In a transparent and collaborative process, many disputed topics/problems were discussed and prioritized for consideration from a sustainable transition perspective.

Continued on page 2

Guiding Question

"What new knowledge, technologies and policy options are needed to ensure that future phosphorus use is sustainable, improves food security and environmental quality and provides benefits for the poor?"



In preparation for Mutual Learning Session (MLS) 1.1, Prof. Liu Xuejun (right, CAU), Dr. Haigang Li (not pictured, CAU), and Prof. Roland Scholz (left, Science Leader Global TraPs) visited the Beilangzhuang hoggerry about 45 km northeast of Beijing. The managing director, Mr. Wen (center), manager of the biogas plant and organic fertilizer factory, is looking forward to a discussion on the practice and multiple options and constraints of manure management in a Chinese hog feeding plant. In support of this MLS on manure management at the Beilangzhuang hoggerry, a group of about 15 Chinese case agents and experts will answer such questions as "What feeding, processing and market structures improve phosphorus management for livestock operations in China?"

Approaching Answers to Contested Issues

One result of this process is recognition that sustainable P management is a complex issue which includes many problems, tradeoffs and constraints for which there is no quick solution. The rules of a transdisciplinary (Td) process provide a means to address complex problems by allowing for development of in-depth understanding, mutual learning and joint orientations among different stakeholders, which leads to a thorough dialog between science and practice. Numerous questions will be addressed in the Mutual Learning Sessions (MLS) and the Dialogue Sessions (DS) of the First Global TraPs World Conference under the umbrella of a closed discourse area. These include:

- Are there potential phosphorus supply issues in the near or long-term future?
- Can we reduce or avoid the significant losses of phosphorus associated with the mining of phosphate rock? What is sustainable phosphorus mining?
- Can we economically avoid gypsum wastes in phosphorus fertilizer production or produce a cleaner/greener gypsum product through new technologies and processes?
- What innovations in phosphorus fertilizers are needed?
- How can smallholder farmers obtain reliable access to phosphorus? What policies are needed?
- What recycling technologies for sewage are environmentally or economically meaningful?
- Is phosphorus in laundry or dishwasher detergents an environmental problem?
- Can we feed 9 billion people and conserve land and water resources without mineral fertilizers?
- What means are available to avoid losses and to increase efficiency along the various nodes of the phosphorus supply demand chain?

The MLS and DS to be discussed at the Global TraPs pre-conference meeting (June 18, 2013 in Beijing) will provide insights and may provide messages and answers to questions of this type. The results of these sessions will be summarized and discussed in the joint session conducted by the Global Partnership on Nutrient Management (GPNM) and Global TraPs on June 19-20.

Exploring Policy Options

As expressed in the title of the First Global TraPs World Conference: Learning from Cases - Exploring Policy Options, there will be 10 to 15 MLS and DS which explore the ways that phosphorus use and management may be meaningfully framed in order to increase efficiency and sustainable use. According to the principles of transdisciplinarity, this is not a desktop study approach, but asks for the broad

understanding of the situational and historic constraints including participation in problem-solving by stakeholders from a wide range of perspectives.

International and intercultural perspectives

The use of fertilizers (including phosphorus fertilizers) differs dramatically between countries. Whereas some African countries apply only 8 kilograms of nutrients per hectare, other countries are applying more than 200 kg/ha of nutrients. Likewise, the virtual flows in industry, recovery from sewage, management of manure or the soil conditions for efficient phosphorus use differ substantially by country. Global TraPs aspires to a sustainable biogeochemical cycle management of phosphorus. This will require the development of a concerted global action program while acknowledging local or regional differences and constraints.

Learning from Chinese Cases

One of the world's greatest challenges is implementing food security while protecting natural resources under conditions of high population growth, dietary change and other factors. China is a good example of this scenario, where a very large population must be nourished by a relatively small area of arable land. This may partly explain why China – with 20 percent of the world population – uses 40 percent of the world's phosphorus fertilizer. The Global TraPs conference offers the opportunity for in-depth discussions on the multiple phosphorus management efforts which are currently underway and represented in MLS. These will include animal production (manure, MLS 1.1, see photo on page 1), meat carcass production (MLS 1.2), sewage recycling (MLS 1.3), vegetables (MLS 1.4) and crop production (MLS 1.5) at various Chinese companies or settings.

You are invited

We invite you to join the MLS and DS at the First Global TraPs World Conference on June 18 and the joint GPNM-Global TraPs conference on June 19-20. Please register soon. The number of persons who may participate in MLS and DS is limited by methodological approaches.



Amit Roy



Roland Scholz



Anjan Datfa



Fusuo Zhang

Global TraPs Case Studies Initiated

Roland Scholz and Deborah Hellums

The objective of the third Global TraPs workshop in August 2011 was “identifying critical questions on sustainable phosphorus management.” In the follow-up workshop in May 2012 (in El Jadida, Morocco), the goal of the conference was “Defining Case Studies – Setting Priorities.” Based on intense discussions in the six Nodes of the Global TraPs project, a set of case studies was identified which should help provide answers to the critical question (see page 1).

The first Global TraPs case studies are underway. With financial support from the Syngenta Foundation for Sustainable Agriculture, two cases studies focused on “improving smallholder farmers’ access to phosphorus by transdisciplinary processes” (SMAP) have started in Kenya and Vietnam. Further case studies are in advanced preparation, including “phosphorus in detergents in Manila Bay or Manila Laguna.”

Global TraPs SMAP Kenya

Providing access for the poor (in this case African smallholder farmers) is a key goal of Global TraPs. The SMAP Kenya project deals with this issue. There is a set of well-known factors such as poor soil conditions, droughts and floods (which are reinforced by climate change), high levels of erosion and nutrient depletion leading to land degradation and poor agriculture performance. While farmers utilize a variety of coping skills, for many their production remains at subsistence or less-than-subsistence levels. Integrated soil fertility management (ISFM) is a practice that has helped many farmers move from subsistence to profitable, market-oriented agricultural production. This approach requires providing farmers technological support so that they adopt a strategy centered on supplementing organic amendments with mineral fertilizers. The Global TraPs Kenya SMAP project focuses on capacity building among smallholders in Uasin Gishu County to adopt improved management strategies based on ISFM while simultaneously linking them to input and output markets. The project will collaborate with smallholder farmers to develop action plans for fertilization. This will be done with a new method relying on Formative Scenario Analysis, a technique in which consistent profiles of actions for farmers as users and agro-dealers as suppliers of mineral fertilizers are constructed. By focusing on developing the relationships between smallholder farmers and agro-dealers, the project will construct possible action strategies that should result in profitable linkages for both groups. In order to improve mineral fertilizer accessibility, the project focuses on designing, developing and establishing new microfinance and trade structures from which both groups of stakeholders may benefit. Synergies with another Syngenta Foundation project on crop insurance

(<http://www.syngentafoundation.org/index.cfm?pageID=562>) are anticipated. In addition to farmers and agro-dealers, SMAP Kenya will also include stakeholders from the financial industry.

As is typical for Td projects, the SMAP Kenya project will have leaders from science and practice. David Nyameino from the Kenya Cereal Growers Association will be the practice leader. A scientist from Egerton University will take the role of the science leader. Training in Td methods and Formative Scenario Analysis to support SMAP Kenya will be prepared by Professors Bernhard Freyer (Boku Vienna, Austria), Olaf Weber (University of Waterloo, Canada) and Roland Scholz (Fraunhofer, Germany).

A similar study is being planned for Uganda.

SMAP Vietnam

Due to high population densities and limited arable land, smallholder farmers in East and Southeast Asia are compelled to harvest a maximum yield from very small areas of land. For instance in Vietnam, there is 0.07 ha of cropland per capita.

The demand for high yields may elicit overuse of fertilizers, including phosphorus. The first stage of the SMAP Vietnam project will initiate the Td process with smallholder farmers north of Hanoi. While the overuse of phosphorus fertilizer is the focus of this project, the methodology is similar to that of SMAP Kenya. The case study will include smallholder farmers, agro-dealers, financial institutions and municipal authorities. The science leader of the case study will be Professor Tran Tien of the Vietnamese Academy of Sciences, Soil and Fertilizer. The practice leader will be identified from the municipal authorities engaged in the project. The Td training and methodological input will be provided by Professor Ulli Vilsmeier, Global TraPs TD coordinator Use Node, Professor Roland Scholz (Global TraPs science leader) and Anh Pallas-Pham (Global TraPs science manager).

Acronyms

MLS - Mutual Learning System

DS - Dialogue Session

Td - Transdisciplinary

KIU - Knowledge Integration Unit

No Evidence of Peak Phosphorus in the Next Decades

Roland Scholz

The prospect of “peak phosphorus” was discussed intensely during the first three Global TraPs workshops. In particular, members of the Exploration Nodes including experts from various geological surveys, mining companies, resources consultancies, international organizations and universities carefully reviewed past, present and predicted data on reserves, resources and demand.

Based on this information, published reports (Van Kauwenbergh, 2010; Jasinski, 2010) and review, a comprehensive paper which related phosphorus data to other essential or critical minerals/elements was prepared by Roland W. Scholz (ETH/Fraunhofer) and Friedrich-Wilhelm Wellmer (former president of the German Geological Survey, or BGR). The highlights of this paper include:

- The Hubbert Curve is an inadequate model for predicting global phosphorus reserves.
- Physical scarcity and economic scarcity are different and must be distinguished.
- There is geological evidence for economically mineable phosphorus for centuries.
- There is incomplete knowledge about total phosphorus resources and reserves which are dynamic figures.
- The complexity of sustainable P management necessitates a Td approach.

The analysis was based primarily (with some verification) on data assimilated by the U.S. Geological Survey (USGS)

on the resources associated with major mines. The main argument developed in the research paper is that phosphorus is a demand market. This can be easily verified by a rough calculation. Considering that there are about 71 gigatons (Gt) of phosphate rock available as recorded by USGS and the annual consumption rate is about 0.2 Gt, total consumption at the current rate would be 1 Gt in five years and 6 Gt in 30 years. Once again, this negates the argument of the peak phosphorus event in 2033 as it has been previously suggested, given that between 67 Gt to 71 Gt of phosphate rock reserves have been identified. Even a doubling of the consumption rate (which is not expected for various reasons) would not change the picture remarkably. It should also be noted that reserves in some countries (apart from Morocco) have increased significantly in the last five years.

The paper provides an in-depth discussion of these issues and an explanation of why the Hubbert linearization is not the best model to predict peak phosphorus and phosphate rock scarcity. The Hubbert curve may have some validity when predicting reserves if there is a limited resource (such as U.S. oil fields or the guano of Nauru [see Déry & Anderson, 2007] and any amount which is offered is taken by the market. This is not the case with phosphate rock where reserve estimates have increased, while future demand is expected to increase in some parts of the world while stabilizing in other regions due to more efficient agriculture, better recycling, etc.

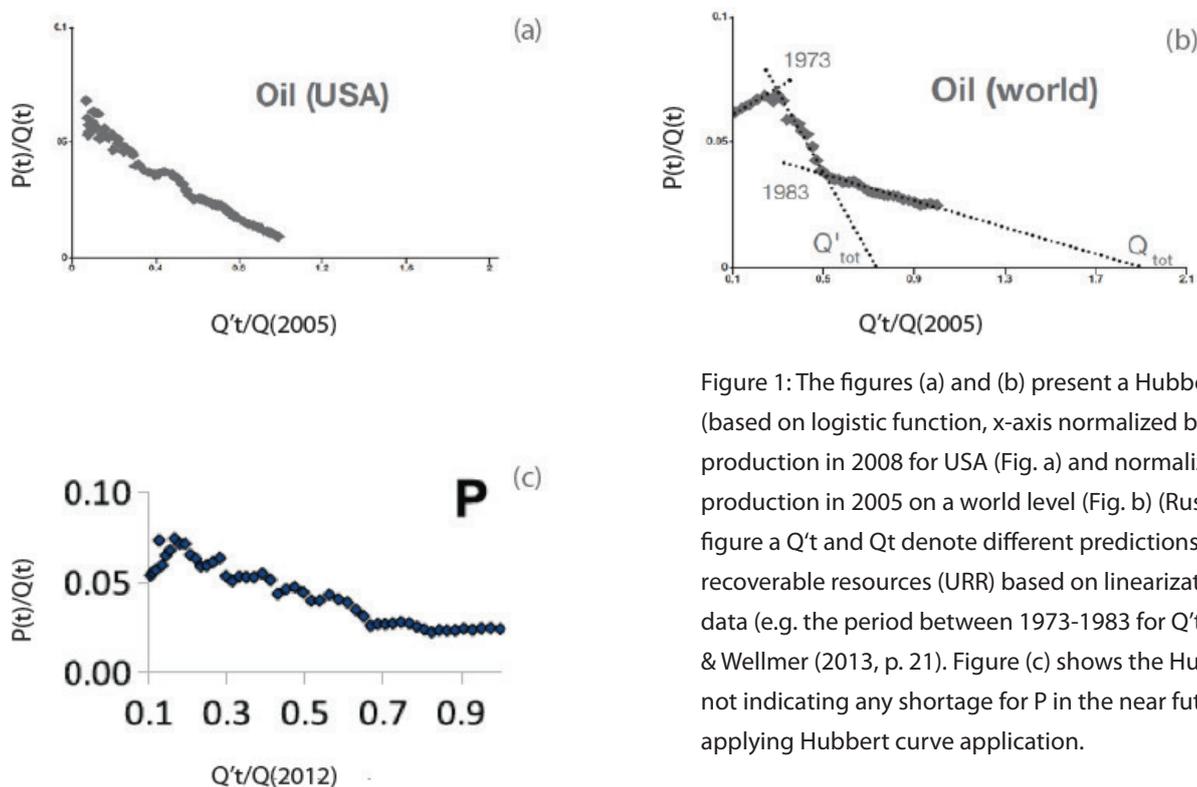


Figure 1: The figures (a) and (b) present a Hubbert Linearization (based on logistic function, x-axis normalized by the cumulative production in 2008 for USA (Fig. a) and normalized by cumulative production in 2005 on a world level (Fig. b) (Rustad, 2012). In figure a $Q't$ and Q_t denote different predictions of ultimate recoverable resources (URR) based on linearization of different data (e.g. the period between 1973-1983 for $Q't$). See also Scholz & Wellmer (2013, p. 21). Figure (c) shows the Hubbert linearization, not indicating any shortage for P in the near future even based on applying Hubbert curve application.

Additionally, the paper shows that the phosphate rock market is demand-driven, meaning that production rises or falls as a result of price increases, technological changes, ecological pressures or consumption level changes (i.e. the growth rate of consumption decreases). Given that phosphorus use is demand-driven rather than supply driven, phosphorus does not show a symmetric production curve. This position is supported by results of previous studies (Rustad, 2012; Vaccari and Stigul, 2011) showing that reliable forecasts for global resources of oil and phosphorus are not feasible with the Hubbert curve approach (see Figure 1).

References:

Jasinski, 2010. Phosphate Rock. In: US Geological Survey (ed.) Mineral Commodity Summaries: USGS
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 Scholz, R. W., & Wellmer, F.-W. (2013). Approaching a dynamic view on the availability of mineral resources: what we may learn from the case of phosphorus? *Global Environmental Change*, 23, 11-27.
 Vaccari, D. A., & Strigul, N. (2011). Extrapolating phosphorus production to estimate resource reserves. *Chemosphere*, 84(6), 792-797.
 Van Kauwenbergh, S.J., 2010. World phosphate rock reserves and resources. Muscle Shoals, AL: IFDC.

German Master’s Students Get involved in Preparing the Beijing Conference

Nils Droste, University of Oldenburg, Germany

A meeting of the Global TraPs’ Knowledge Integration Unit (KIU) for the took place in Lüneburg, Germany on January 15-16, 2013. Twelve Master’s level students from the universities of Oldenburg and Leuphana seized the opportunity to become part of the KIU team engaged in preparation and organization of the MLS and DS planned for June 18th in Beijing. There will be two types of student involvement. Some students will prepare their master’s theses about the methodology of the MLS and DS, or on an embedded case study about phosphorus management in the greater Manila area. Others will contribute to the preparation of the sessions with practical support.

The team will participate in creation and sharing of knowledge resulting from the multi-disciplinary discourse that results from bringing together practitioners and scientists. This Td approach offers them an opportunity to gain new knowledge

from others in the academic community as well as practitioners who are engaged in the production, use and recycling of P for everyday use. All of the students are interested in contributing to the identification of collaborative and comprehensive solutions for the challenges of the 21st century, and see active engagement in the Td process for sustainable P management as an opportunity for a real world experience.

At both universities the students had previously been introduced to the Td process. While Lüneburg students already have a Td project integrated into their curriculum, the Oldenburg students initiated a Td project in 2012 – a three day sustainability exchange, called the NachDenkstatt (www.nachdenkstatt.de). In 2013 a more multiplicative event is planned.



Professors and students from Oldenburg University and Leuphana University (Germany) Supporting Global TraPs in preparing the MLS and DS for the Beijing conference. From left to right Prof. Dr. Daniel J. Lang (Dean of the Faculty of Sustainability Science, Leuphana), Philip Luthardt, Rina-Marie Maas-Deipenbrock, Clemens Olbrich, Nino Sean, Franz Ecker, Franziska Fischer, Nils Droste, Marie Schönau, Janina Steigerwald, Colin Bien, Prof. Dr. Ulli Vilsmaier (Professor for Transdisciplinary methods, Leuphana University) , Moritz Meyer, Ngoc Anh Pallas Pham (Science Manager Global TraPs) and Prof. Roland W. Scholz (Science leader Global TraPs, Fraunhofer Institute).

Phosphorus “Re-processing” Industry Clusters Meet in Europe and Japan

C. Kabbe, Global TraPs Practice Leader Recycling Node, KompetenzZentrum Wasser Berlin
and
Ryo Sugawara, Phosphorus Recycling Promotion Council Secretariat



From left: Eight members from trade and industry, two members of public authorities and seven members from science institutions met at Fraunhofer IWKS, Alzenau, Germany for a meeting of the “Global TraPs Reprocessing Cluster Industry Europe.” From the left: Jan Neuber (OAM Trading), Daniel Hairi (H-CPE), Michael Spitznagel (Ministry of Environment, Bavaria), Daniel Steppich (SGL), Kees Langeveld (ICL-Europe), Willem Schipper (formerly Thermphos), Christian Kabbe (KZBerlin), Roland Scholz (Fraunhofer SIC-IWKS) Oliver Gantner (University of Augsburg), Rudolf Stauber, Gerhard Sextl, Stefan Gäth, Walter Schindler (all Fraunhofer SIC-IWKS), Eva Stössel, Ruediger Wissemborski (Budenheim), Hermann Ludwig (Outotec), Armin Reller (Fraunhofer SIC-IWKS)

Various technologies for recycling phosphorus from sewage and manure are currently available or under development. However, the adoption of available technologies is limited for a variety of reasons ranging from overall economics to a lack of required infrastructure. In preparation for important discussions on recycling at the upcoming Global TraPs Conference in Beijing and to identify the best options for concerted action, there was an initial meeting of some members of the Global TraPs Processing and Dissipation and Recycling Nodes in Alzenau, Germany at the Fraunhofer Project Group IWKS (Materials Recycling and Resource Strategies) on February 8, 2013.

The discussions centered on state-of-the-art technologies, real market experiences and policy means with inputs from representatives of science, industry practice and policy. These discussions led to the identification of priorities and concrete actions to promote the recycling and re-processing of phosphorus on a broad scale. It was agreed that now was the time to bring practical solutions to solve the problem of inefficient phosphorus recycling and re-use associated with everyday phosphorus use. To foster phosphorus recycling and

re-processing, all agreed that platforms at the national level were necessary. Ideas for developing a platform that would yield solid results were discussed with general agreement that such a platform should serve as both a monitoring and implementation platform, bringing all relevant stakeholders and sectors from science, industry (practice) and policy together. Active support and cooperation in generating projects is also expected. The participants agreed to draw on the positive examples already established in the Netherlands (Dutch Value Chain Agreement and Nutrient Platform) and in Japan (Phosphorus Recycling Promotion Council of Japan, or PRPCJ), to develop an agenda to promote phosphorus recycling and processing in Germany and to contribute to other national or regional efforts wherever possible.

If you are interested in joining the Global TraPs (Re)-processing Industry Cluster [RICE], please contact Christian Kabbe (christian.kabbe@kompetenz-wasser.de) or Ludwig Herrmann (ludwig.herrmann@outotec.com).

A second meeting took place in Tokyo, Japan on February 18. The meeting was organized by the PRPCJ and hosted by

the Fertilizer and Ammonia Producers Association, with active participation by Professor Roland Scholz, Professor Hisao Ohtake and other Japanese Global TraPs members.

As in Alzenau, the PRPCJ meeting discussed sustainable business options, research demands and policy means which are linked to phosphorus recycling, as well as the different streams of sewage, manure and other fractions of waste. It was used as a preparatory meeting before the European Sustainable Phosphorus Conference (ESPC2013) planned for Brussels, Belgium (March 6-7) and the First Global TraPs World Conference.

The morning session included participation by Global TraPs members Dr. Roland Scholz, Dr. Hisao Ohtake, Dr. Masaru Yarime and Dr. Kazuyo Matsubae and Yoshisada Narita (PRPCJ vice president, JAF) and Ryo Sugawara (PRPCJ secretariat, JORA). Discussions centered on similarities and differences between the EU and Japan as related to phosphorus in the areas of policies on recycling and resource security and the status of recovery technology for phosphorus from agriculture use including fertilizer overuse and waste management.

The afternoon session (with the additional participation of Dr. Hideaki Shiroyama), included informal discussion on a number of topics including:

- Global TraPs project (Prof. Scholz)
- Japanese situation on phosphorus recycling and PRPCJ activity (Prof. Ohtake)
- Technology and implementation of phosphorus recovery by Japanese companies (Asahi Kasei Chemicals Corporation, Taiheiyo Cement Corporation)
- Continued discussion on the similarities and differences between Europe and Japan in recycling programs, especially on social and industrial motivation, supportive policy, importance of Td and collaboration of multi-stakeholder such as Industry-Academia-Government.

If one is interested in joining future meetings of Global TraPs members involved with the PRPCJ, please contact Masaru Yarime (yarime@k.u-tokyo.ac.jp) or Hisao Ohtake (hohtake@bio.eng.osaka-u.ac.jp). If one is interested in joining or contributing to the PRPCJ, please contact Dr. Ohtake or the PRPCJ Secretariat (prpc@jora.jp).



From the left (front) : Dr. Masaru Yarime (Global TraPs, UT), Rie Nishisako (MLIT), Dr. Hisao Ohtake (PRPCJ president, Global TraPs, OU), Dr. Roland Scholz (Global TraPs), Makoto Iikeda (PRPCJ board, JFFIA), Yoshisada Narita (PRPCJ vice president, JAF)

From the left (rear) : Naohito Ishigami (PRPCJ, Swing), Tokumi Mochiyama (PRPCJ, Nippon Phosphoric Acid), Tateki Kurosawa (PRPCJ, Swing), Yoshinao Ogawa (MAFF), Hideo Yamamoto (PRPCJ, JSWA), Dr. Hiroyuki Takano (PRPCJ, Taiheiyo Cement), Hiroshi Motoyoshi, (PRPCJ, Onoda Chemical), Dr. Hiroyoshi Ohya (PRPCJ, Asahi Kasei Chemicals), Nobuo Takagi (PRPCJ, Nippon Chemical), Kazuo Sugahara (PRPCJ board, Onoda Chemical), Hajime Hori (J-Oil Mills) and Mitsufumi Hashimoto (PRPCJ, Taiheiyo Cement)

Fraunhofer Institute to Assume Global TraPs Science Leadership

The Fraunhofer Institute (Germany) is Europe's largest application-oriented research organization with 66 institutes and research units. During the fourth quarter of 2012, Fraunhofer made a commitment to support the Global TraPs project beginning in 2013. As part of the commitment, it will assume the role of science leadership and will be the science institution hosting the Global TraPs umbrella project. This scientific effort will be led by Professor Armin Reller (Science Leader Processing Node) and Professor. Roland W. Scholz (Global TraPs Science leader) both of whom will be members

of the expert group involved in creating a new institute for Materials Recycling and Resources Strategies (IWKS). The IWKS will emerge from the SIC, a silicate research institute first organized in 1926 before becoming part of Fraunhofer in 1971. The research divisions of this new IWKS institute will be Resources Strategies, Substitution and Recycling. Professor Scholz will deal with cross-cutting issues including Transdisciplinary Technology Development and Global TraPs. The new institute, to be located near Frankfurt in Hanau/ Alzenau, will include laboratories for experimental research.

Anh Pallas-Pham Joins Global TraPs in Preparation for the Beijing Conference



Anh Pallas-Pham joined the Global TraPs project as science manager (part-time) on January 1, 2013. Her initial activities will focus on preparations for the MLS and DS to be conducted at the Global TraPs World Conference. In addition, she is actively involved in a case study on the overuse and underuse of phosphorus by Vietnamese smallholder farmers.

Master's degree in Environmental Science from the Swiss Federal Institute of Technology Lausanne (EPFL) in 2003. In the framework of her program at EPFL, Pallas-Pham conducted research at the Swiss Federal Institute of Aquatic Science and Technology (EAWAG) in Duebendorf, Zurich. The research centered on an "Analysis of Fluoroquinolones Antibiotics in Hospital Waste Water."

Prior to pursuing her Master's degree, Pallas-Pham worked as a researcher at the Center of Environmental Technology and Sustainable Development (Hanoi) and at EAWAG. Her primary research area was the analysis of endocrine disrupting chemicals and antibiotics residues in various types of aquatic samples. Since 2004 she has worked as a consultant for different Swiss companies in developing ISO (9001 and 14001) management systems.

Pallas-Pham earned a Bachelor's degree in Chemical Technology from Hanoi University of Science, Vietnam National University, in 2001. Her research studies focused on the "Treatment of wastewater of pulp- and paper- mill effluent using bio-organisms and charcoal." She earned a

Announcement

Td Summer School 2013

Transdisciplinary Research at the Science | Society Interface
September 1-6, 2013 Td Training Module
September 9-10, 2013 Special Training Module



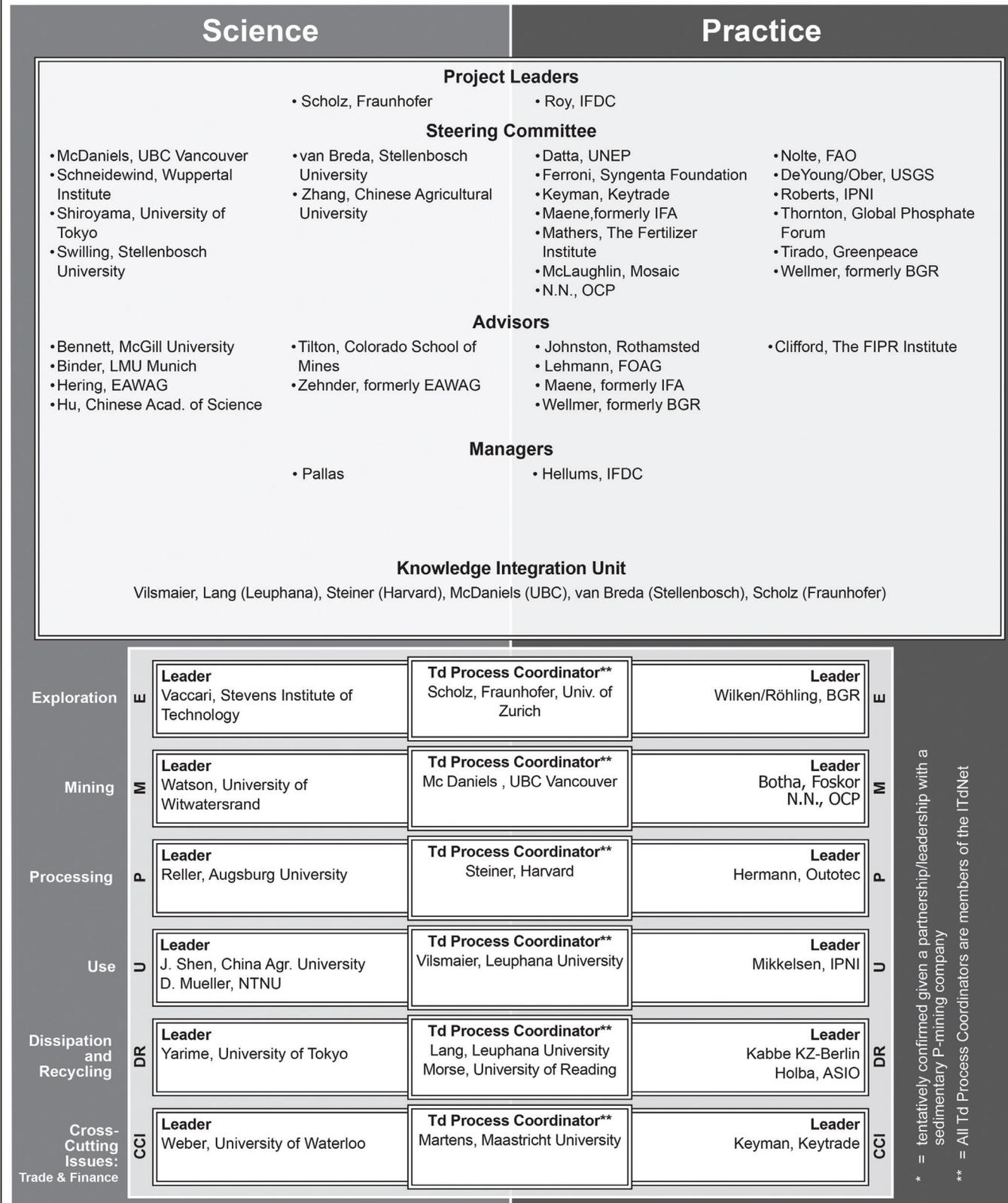
We are pleased to announce the **Td Summer School 2013** will be held at Leuphana University of Lüneburg/Center for Methods, Germany, from September 1–10, 2013.

The Td Summer School offers a five-day intensive training (Td Training Module) in Td research, preparing researchers as well as practitioners for joint research on societal challenges. Both, theoretical background and practical experiences in designing and applying transdisciplinary research methodology will be gained. A special focus is on broadening the participants'

disciplinary and interdisciplinary research towards a Td approach. Subsequently, a two-day special training on constellation analysis will be offered (Special Training Module) in cooperation with the Center for Technology and Society at Technische Universität Berlin, Germany. Participation in only one of the modules is possible. Registration will start on March 15, 2013.

For further information see: www.leuphana.de/cm-td-training or contact Ulli Vilsmaier (cm-td-training@leuphana.de).

Organizational Chart of the Global TraPs Project (Jan. 2013)



Umbrella Project

Node Level

* = tentatively confirmed given a partnership/leadership with a sedimentary P-mining company
 ** = All Td Process Coordinators are members of the ITdNet

Global TraPs First World Conference

*“Learning from Cases –
Exploring Policy Options”*

to be held in conjunction with the

Fifth International Nutrient Management Symposium

under the auspices of the

Global Partnership on Nutrient Management (GPNM)

Beijing, China • June 18-20, 2013

Hosted by

China Agricultural University

with the support of the Ministry of Agriculture and the Ministry of Education

People’s Republic of China



GLOBAL TraPs

TRANSDISCIPLINARY PROCESSES FOR SUSTAINABLE PHOSPHORUS MANAGEMENT

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