

Exponent®

**Summary Report on the  
APEC Workshop on Metals  
Risk Assessment  
Cebu, Philippines on 28–29<sup>th</sup>  
August 2015**



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Workshop on Metals Risk  
Assessment  
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August 2015**

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## Background and Purpose

The Asia Pacific Economic Cooperation (APEC) Chemical Dialogue (CD<sup>1</sup>) serves as a forum for regulatory officials and industry representatives to find solutions to challenges facing the chemical industry and users of chemicals in the Asia-Pacific region. It reflects APEC members' recognition of the importance of engaging with the private sector and building public-private sector dialogue and cooperation for mutual benefit. Issues addressed by the CD include chemical sector liberalization, chemical trade facilitation, and capacity building. The CD also focuses on improving regulatory policies and practices; it seeks workable regulatory programs that ensure that regulatory, safety, and environmental goals can be implemented by both governments and businesses.

In 2015, the CD initiated an intermediate-to-advanced training program that focuses on building the capacity of the regulatory communities in APEC economies to undertake the scientifically robust risk assessment of metals and metal compounds. This recognizes that the technical concepts needed for accurate assessment of these are often different from those commonly applied in the assessment of organic chemicals. The training program is being funded by industry (coordinated by ICMM), and official coordination and leadership within the CD are being provided by the Government of Australia. A formal Project Planning Committee comprising APEC economies and industry representatives was established (see appendix A) to oversee the process. Dr. Matthew Gredley, of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Australian Department of Health, led the APEC aspects on the organization and review of the workshop. Dr. Ben Davies, International Council on Mining and Metals (ICMM), and Dr. Randall Wentsel, Exponent, led the technical development of the workshop.

One key step in the training program was a 1.5 day workshop, which took place 28–29<sup>th</sup> August in Cebu, Philippines. This provided a major component of the training, and identified ongoing needs for further resources and training that can be met remotely by the end of 2016 and beyond. The workshop provided an interactive environment to document and discuss approaches to addressing specific challenges in the risk assessment of metals and metal compounds. A prerequisite for workshop attendees was knowledge of basic risk assessment concepts as generally applied to chemicals (typically organic chemicals).

<sup>1</sup> <http://www.apec.org/Groups/Committee-on-Trade-and-Investment/Chemical-Dialogue.aspx>

## **Goals and Objectives of the Workshop**

The overall goal of the workshop was to design and deliver training materials for a dynamic and interactive workshop on metals risk assessment that contributes to the objectives of the APEC Metals Risk Assessment training program. These objectives are as follows:

- Build participants' knowledge and understanding of the risk assessment of metals and metal compounds by holding an intermediate-to-advanced 1.5 day training workshop for regulators that will document and discuss current approaches used by APEC economies informed by work undertaken by non-APEC entities.
- Share that knowledge and understanding through the broader regulatory community (i.e., beyond workshop participants) by developing the conclusions of and the materials from the workshop into training tools such as webinars, technical documents, fact sheets, and case studies.

## **Science Panel**

To ensure scientific excellence, a team of three independent (APEC sponsored) scientific advisors was established to support the planning and delivery of the training program. The panel members reviewed the workshop materials and ensured that the concepts presented were current and credible. The members are listed below.

### **Dr. Daniel Krewski**

Dr. Krewski has been a Professor at the Department of Epidemiology and Community Medicine in the Faculty of Medicine at the University of Ottawa since 1998 as well as the Director of the R. Samuel McLaughlin Centre, where he holds the NSERC/SSHRC/McLaughlin Chair in Population Health Risk Assessment. He is also the Scientific Director of the PAHO/WHO Collaborating Centre in Population Health Risk Assessment at the University of Ottawa.

### **Dr. Michael Dourson**

Dr. Dourson is a Professor at and the Director of the Toxicology Excellence for Risk Assessment Center (the TERA Center) at the University of Cincinnati College of Medicine. The mission of the TERA Center is to support the protection of public health by developing, reviewing, and communicating risk assessment values and analyses; improving risk methods through research; and educating risk assessors, managers, and the public on risk assessment issues.

### **Dr. Michael McLaughlin**

Dr. McLaughlin is currently a Fellow of the Commonwealth Scientific and Industrial Research Organization (CSIRO) and a Professor in the School of Earth and Environmental Sciences at the University of Adelaide, Australia.

## Workshop Topics Addressed and Agenda

The development of the agenda was informed by suggested topics in the ICMM terms of reference and by the APEC-sponsored advisory group. In addition, a survey of APEC economies conducted in 2013 indicated that an intermediate level training on metals risk assessment was needed. The agenda for the 2015 workshop is presented in Appendix B. The workshop was divided into theoretical plenaries and practical break-out sessions, which addressed four themes: ecological assessment, human health assessment, regulatory issues, and ecological and human health criteria for metals. An introductory paper provided an overview of key issues for metals risk assessment, which was followed by more detailed discussion for ecological endpoints in aquatic and terrestrial environments. For human health, an emphasis on risk assessment methods was presented as preferable to hazard assessment, which was followed by unique aspects of metals risk assessment in exposure analysis, bioaccessibility, and bioavailability. Regulatory and criteria discussions informed the participants about developments in other countries and the Organization for Economic Co-operation and Development (OECD). The workshop presentation titles and key topics for each talk are presented in Table 1.

We were fortunate to be able to recruit international experts from business, academia, and government to speak at the workshop. Brief biographies are presented in Appendix C. The speakers were as follows:

Dr. Randall Wentsel, Exponent (United States)  
Dr. William Adams, Rio Tinto (United States)  
Dr. Michael McLaughlin, CSIRO (Australia)  
Dr. Michael Dourson, University of Cincinnati (United States)  
Dr. Daniel Krewski, University of Ottawa (Canada)  
Dr. Adriana Oller, Nickel Producers Environmental Research Association (NIPERA) (United States)  
Ms. Yvette Lowney, Exponent (United States)  
Dr. Joop de Knecht, OECD (Non-APEC, Invited Guest)  
Dr. Visitacion Antonio, East Avenue Medical Center, Manila (Philippines)  
Dr. Janith Wickramaratna, National Industrial Chemicals Notification and Assessment Scheme (NICNAS) (Australia)

**Table 1. Workshop presentations, breakout groups, and key topics**

Presentation Title	Key Topics
Overview on unique aspects of metals in risk assessment	Risk assessment diagram, overview metals and inorganic metal compounds risk issues, metal characteristics, environmental chemistry, essentiality, metals background
Aquatic fate and toxicity	Aquatic chemistry of metals, background, measuring dissolved concentrations, sediment sampling for acid volatile sulfide (AVS); bioavailability, bioaccumulation; analytics for biotic ligand model (BLM).
Bioavailability issues for soil organisms	Background, uptake in plants, biodilution, rare biomagnification, which metals are of primary concern, ecological criteria
Ecological breakout groups	Group A: soil bioavailability case study on Australian guidance, normalization standards Group B: aquatic case studies BLM water quality calculation and transformation/dissolution protocol (T/DP)
Risk assessment and hazard identification for metals	Comparison of hazard identification and dose-response, key issues for metals in human health risk occupational exposure, risk characterization
Approaches to exposure assessment for metals	Overview of key human health pathways: ingestion, inhalation, drinking water, metals specific issues
Bioelution-based approaches for metals	Link between bioavailability and toxicity, general bioelution principles, consideration of bioavailability in classifications, precedents for use in regulations
Bioavailability adjustments in human health risk assessment for metal contaminated sites	Soil ingestion process, relative oral bioavailability, controls on bioavailability of metals in soil, <i>in vivo/in vitro</i> soil methods
Human health breakout groups	Group A: case study mercury exposure and essential metals Group B: case studies on lead risk assessment (IEUBK model) and arsenic in rice Group C: case studies on MECLAS (Metals Classification Tool) for complex metal materials and using bioaccessibility data for grouping metal compounds
Regulatory issues for metals in the Philippines	Philippines regulatory issues and research program on lead
OECD role in international acceptance of data	Metals regulatory guidance, data quality and availability, sources of data
Regulation of metals in aquatic	Tiered approach for assessment (EU); Ecotox data and criteria values: utility for tropical/Asian systems, how to implement, case study
Regulation of metals in soils	Sources of metals, development of soil criteria for ecological effects and applicability to APEC economies
Human health criteria and standards	Dose-response to criteria, soil and drinking water standards/criteria, internet sources of risk assessment information, consideration of dosimetry and particle size when setting occupational exposure limits (OELs)

## Materials Provided

In advance of the workshop, attendees were provided with a great deal of technical information on metals. In addition, they were also given a USB stick containing the following materials:

- Primers on ecological and human health risk assessment
- Principles for risk assessment of metals
- Terminology
- 20 fact sheets on specific metals assessment issues sourced from US EPA or EU peer-reviewed government documents
- Guidance documents from US EPA (Metals Framework), EU (MERAG, HERAG), Australia (soil criteria), and REACH
- publications on key technical topics (abstracts or open source documents)
- Workshop presentations
- Breakout group case studies

## Attendees

The workshop was well-attended with 57 trainees from 15 APEC economies and three non-APEC economies. There were nine speakers, two observers, and four organizers. The attendees are listed in Appendix D.

## Survey and Feedback

Dr. Matthew Gredley, NICNAS, developed a survey for the workshop attendees to provide their opinions on the usefulness of the workshop and their further interest in topics for further training in metals risk assessment (Appendix E). The numerical evaluation of the workshop is presented in Table 2, and it indicates a response of very good to excellent on the satisfaction of the attendees of the workshop. However, written responses indicated that attendees wanted more time for the workshop, more discussion, and more hands-on case studies. A specific goal of the workshop was to provide intermediate-level training on metals risk assessment issues; however, for a significant number of the attendees, this level was above what they could effectively assimilate.

**Table 2. Numerical survey responses from participants**

Question	Please rate the following on a scale of 1 to 5, where 5 means you strongly agree, and 1 means you strongly disagree.
The training was at the advanced technical level.	4.5
I will be able to apply the knowledge I learned to my job.	4.0
Breakout sessions provided adequate, hands-on training.	4.0
How do you rate the training overall?	4.3
Apart from webinars, please rate the likely usefulness of the following tools to be produced in 2015:	
Fact sheets	4.6
Technical documents	4.7
Next steps: Do you see a need for even more detailed, hands-on training in specific topics covered by the workshop? Such training would most likely need to be delivered on a regional rather than APEC-wide basis.	4.6

Dr. Matthew Gredley provided a thorough analysis of the survey results which are provided below.

- General attendance stats:
  - 45 forms were completed from 59 trainees (including observers), a 76% response rate, which is sufficient for an end-of-workshop survey.
  - All forms included the participant's identity.
- Relevance and organisation of the workshop:
  - There was broad acknowledgement that the workshop was indeed at an advanced level.
  - The proposition that the knowledge learned can be applied on the job was highly regarded.
  - The breakouts were well-regarded as providing adequate hands-on training, but this is probably overstated as evidenced by the free text comments, where there was a broad concern that more time was needed for adequate discussion.
  - Overall, a high level of satisfaction was reported.
- Creation of on-going training tools:
  - There was moderate support for the proposed webinars: roughly 20 participants cited an interest in webinars to present case studies (~40% of trainees), but slightly more participants also wanted fact sheets and technical documents.
  - Survey results indicate participants want these tools to cover a fairly even range of topics. As these topics were drawn from the workshop agenda, this also indicates all the topics covered by the agenda were also of broad interest.
- Next steps:
  - A very high demand was noted for more detailed, hands-on training in specific topics covered by the workshop; the range of topics covered was generally satisfactory, but there should be more case study-based learning.
  - Offer other areas of training in broad chemicals management (covers a range of topics).

## Discussion

The goals for the workshop were to build participants' knowledge and understanding of the risk assessment of metals and metal compounds by holding an intermediate-to-advanced 1.5 day training workshop. Feedback from workshop participants indicated that these goals were met or exceeded. Materials, including technical documents, fact sheets, and case studies, were generated or made available to support the second goal of the workshop, which was to share that knowledge and understanding to the broader regulatory community (i.e., beyond workshop participants.)

### Key conclusions

Several key learnings were identified as being vital points of departure for the assessment of metals and metal compounds compared with traditional risk assessment for organic chemicals, these were:

- the different physicochemical properties of metals and metal compounds intimately affect their toxicity and bioavailability to organism – hence these properties must be well characterized by the assessor;
- the specific physicochemical properties of environmental media in turn impact on the physicochemical properties of metals and metal compounds – hence, the local chemistry of environmental media needs to be profiled when determining the toxicity and bioavailability of metals and metal compounds; and
- as many metals are essential for life, the different sensitivities of local environmental organisms need to be profiled in order to accurately determine the toxicity of metals and metal compounds under local conditions.

Presentations from the workshop are openly available and below is a brief summary of the key discussion points from the day:

#### **Generic properties of metals that make them unique:**

- Speciation, solubility redox, which are affected by environmental conditions, impact the bioavailability of elemental metals and their ions
- Toxicologists need to distinguish between levels of metals that represent nutritional essentiality and that cause toxicity
- Basic risk assessment paradigms for organic chemicals apply to metals and metal compounds need to be adapted

#### **Aquatic toxicity of metals**

- Biotic Ligand Model used as total metal levels are not a good indicator of toxicity, considers temperature etc effects
- Normalisation of bioavailability in light of environmental conditions

- NOECs change with different environmental conditions, so need to localise NOECs for specific water chemistry
- Biomagnification generally not important for metals, except for methyl mercury

#### **Bioavailability for soil organisms**

- Bioavailability is more complex than in aquatic media due to soil affinity and ageing issues
- Added Risk Approach distinguishes risk from b/g versus added levels of metals in soils
- Geochemical normalisation seeks to predict geogenic levels of metals based on naturally-occurring levels of ores such as iron oxide
- Application of Biotic Ligand Model to metals in soil currently too complex
- Collection of appropriate reference samples is subject of extensive guidance

#### **Human Health Risk Assessment and hazard identification for metals**

- When assessing dose-related data, ascertain if doses are reported as level of the metal equivalent or of the metal compound
- Essentiality – don't set safe exposure levels below daily recommended intake

#### **Approaches to exposure assessment**

- Physical form, chemical form, valency and target organ need to be considered in determining exposure
- Biomonitoring equivalents – measure of internal exposure rather than looking at external exposure from source, but these are not yet available for metals
- Illustrated with examples aluminium, manganese and copper

#### **Bioelution-based approaches**

- Bioaccessability as a surrogate for bioavailability and toxicity
- Transformation-Dissolution Protocol incorporated into some regulations
- Application of bioaccessability to read-across, but be careful of multiple valencies

#### **Bioavailability adjustments in human health risk assessment for metal contaminated sites**

- Need to adjust bioavailability lab studies to take account of soil partitioning in field studies

#### **Human health issues arising from environmental exposure to heavy metals in the Philippines, and how risk assessment was used to address various problems**

- Exposure to lead from waste dumps
- Fish advisories from mercury contamination
- Mercury exposure in artisanal gold mining

#### **Application of metals in aquatic systems in different jurisdictions**

- Purpose of standards re promoting growth of aquatic species and protection of human health in recreational use

### **Regulation of metals in soils**

- Consider different sources of metals in soils (different complexity for remediation)
- Consider chemical effects (valency, leaching, ageing and local conditions (pH, clays, geogenic ores)
- Mercury exposure in artisanal gold mining

### **Application of metals in aquatic systems in different jurisdictions**

- Purpose of standards re promoting growth of aquatic species and protection of human health in recreational use
- Developing levels in your own region – local b/g, bioavailability adjustment, or use single value standard
- Secondary poisoning – most metals don't biomagnify
- Removing metals from soils – solubility/partial extractions

### **Human health criteria and standards**

- Basic risk assessment considerations
- Framework for risk assessment of mixtures
- Grouping chemicals into Common Assessment Groups
- Toxicity databases

These points will be further addressed through the follow up activities planned to take place through to the end of 2015 (see below).

Dr. Matthew Gredley generated notes and a closing discussion PowerPoint on key issues presented by the speakers during their talks and during the breakout discussions. These documents provide additional information on aspects of the workshop.

## **Options for Next Steps**

The workshop was a success due to the excellent planning and technical support for the workshop, the thorough presentations by the speakers, and the number of economies that had participants at the workshop. However, as with most workshops, the time allotted was insufficient for the participants to absorb all of the information presented. It is hoped that the participants can review the materials provided upon return to their economies and use them as a resource for future projects.

- Deliver three webinars (in late 2015 and early 2016).
  - More specific elements of risk assessment, using case study-specific problem discussion
  - Exposure calculations for release of metals
  - Quarter-half day case study on the industry assessments in REACH dossiers;
  - Demonstration of specific tools, such as the BLM, MECLASS, the Soil PNEC calculator

- Use suggestions by the participants for specific metals-related issues they are dealing with, and then host webinars to present case studies addressing those issues.
- Review whether additional fact sheets focused on case studies would be beneficial. Provide participants with existing OECD guidance documents. This information will address needs indicated in the post-workshop survey questionnaire
- Investigate the possibility of involving the Asia-Pacific unit of the Society of Environmental Toxicology and Chemistry (SETAC) to host additional training at their meetings in that region of the world
- Contact individual economies for suggestions on specific issues and their preferred method to receive further information on metals risk assessment issues.
- Provide protocols for collecting reference soil samples to determine geogenic metal levels.
- Provide some guidance to APEC economies to use overseas models and approaches with care in conducting more thorough risk assessments. Input for the models needs to include national/regional factors and parameters.

## **Appendix A**

### **Project Planning Committee Members**

## Project Planning Committee Members

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Name	Organization and economy
Dr. Matthew Gredley (APEC project overseer)	National Industrial Chemicals Notification and Assessment Scheme (NICNAS), Office of Chemical Safety, Australian Department of Health, Australia
Dr. Ben Davies (industry coordinator)	International Council on Mining and Metals (ICMM), United Kingdom
Mr. Richard Matheson	Nickel Institute, Australia
Ms. Francisca Dominguez	Codelco, Chile
Ms. Vilma Morales	Directorate General of Environmental Quality, Ministry of the Environment, Peru
Ms. Emmanuelita Mendoza	Environmental Quality Division, DENR- Environmental Management Bureau, Philippines
Dr. Jowitt Li	Safety and Health Technology Center (SAHTECH), Chinese Taipei
Dr. Randall Wentzel (workshop coordinator)	Exponent, USA

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## **Appendix B**

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### **Agenda**

**AGENDA**  
**APEC Workshop on Metals Risk Assessment**  
**28–29 August 2015**  
**Niña 1, Radisson Blu Hotel, Cebu City, Philippines**

**DAY 1, Friday, 28 August**

<b>TIME</b>	<b>ACTIVITY</b>	<b>SPEAKER/MODERATOR</b>
8:30	Welcome and overview of metals workshop	<ul style="list-style-type: none"> <li>• Mr. Ryan MacFarlane, CD Co-Chair</li> <li>• Dr. Matthew Gredley, NICNAS</li> <li>• Dr. Randall Wentzel, Exponent</li> </ul>
9:00	<p>Unique aspects of metals and inorganic metals compounds in environmental and human health risk assessments</p> <p><i>Key topics of talk: risk diagram, overview metals and inorganic metal compounds risk issues, metal characteristics, environmental chemistry, essentiality, metal background, hazard classification</i></p>	Dr. Randall Wentzel, Exponent
<b>Environmental Assessment</b>		
<ul style="list-style-type: none"> <li>• <b>Metals in water</b></li> </ul>		
9:30	<p>Fate, transport, and aquatic chemistry of metals</p> <p><i>Key topics of talk: aquatic chemistry of metals, background, measuring dissolved concentrations, sediment sampling for Acid Volatile Sulfide (AVS); bioavailability, bioaccumulation; analytics for Biotic Ligand Model (BLM).</i></p>	Dr. William Adams, Rio Tinto
9:50	<p>Aquatic toxicity of metals</p> <p><i>Key topics: standard methods, applicability to Asia-Pacific region, use of BLM, and AVS-SEM for aquatic criteria, environmental classification</i></p>	Dr. William Adams, Rio Tinto
10:10	<b>BREAK</b>	

<b>• Metals in soil</b>		
10:30	Bioavailability issues for soil organisms  <i>Key topics of talk: background, uptake in plants, biodilution, rare biomagnification, which metals are of primary concern, criteria</i>	Dr. Michael McLaughlin, CSIRO
<b>Breakout Groups A&amp; B parallel</b>		
11:10	Soil bioavailability issues group  <i>case study on: Australian guidance; normalization standards</i>	Dr. Michael McLaughlin, CSIRO
	Aquatic Group  <i>case studies: BLM water quality calculation; transformation/dissolution protocol (T/DP)</i>	Dr. William Adams, Rio Tinto Dr. Philippa Huntsman-Mapila, NRCan
12:00	<b>LUNCH</b>	
<b>• Metals and Human Health</b>		
1:30	Risk assessment and hazard identification for metals  <i>Key topics of talk: comparison of hazard identification and dose-response; key issues for metals in human health risk occupational exposure; risk characterization</i>	Dr. Michael Dourson, University of Cincinnati
2:10	Approaches to exposure assessment for metals  <i>Key topics of talk: overview of key human health pathways: ingestion, inhalation, drinking water; metals specific issues, the use of dosimetry models, ambient air aerosols.</i>	Dr. Daniel Krewski, University of Ottawa
2:50	<b>BREAK</b>	
3:10	Bioelution-based approaches for metals  <i>Key topics of talk: Link between bioavailability and toxicity, general bioelution principles, consideration of bioavailability in classifications, precedents for use in regulations, advantages and limitations of</i>	Dr. Adriana Oller, NIPERA

	<i>bioelution-based approaches</i>	
3:50	Bioavailability adjustments in human health risk assessment for metal contaminated sites Speaker:  Key topics of talk: Soil congestion process, relative oral bioavailability, controls on bioavailability of metals in soil, <i>in vivo/in vitro</i> soil methods	Ms. Yvette Lowney, Exponent
<b>Breakout Groups A, B, &amp; C parallel</b>		
4:20	Group A: Human health case study: mercury exposure and essential metals	Dr. Michael Dourson, University of Cincinnati
	Group B: Human health case studies: lead risk assessment (IEUBK model) and arsenic in rice	Ms. Yvette Lowney, Exponent
	Group C Human health case studies: MECLAS (Metals Classification) tool for complex metal materials and Using bioaccessibility data for grouping metal compounds	Dr. Adriana Oller, NIPERA Dr. Janith Wickramaratna, NICNAS
5:30	<b>ADJOURNMENT</b>	

### DAY 2, Saturday, 29 August

TIME	ACTIVITY	SPEAKER/MODERATOR
<b>Regulatory Issues for Metals</b>		
8:30	Regulatory issues for metals in the Philippines,  <i>Key topics of talk: regulatory issues and research program on lead</i>	Dr. Visitacion Antonio, East Avenue Medical Center, Manila
9:00	OECD role in international acceptance of data  <i>Key topics of talk: metals regulatory guidance, data quality and availability, sources of data</i>	Dr. Joop de Knecht, OECD
<b>Criteria and Standards for Metals</b>		
9:30	Regulation of metals in aquatic systems  <i>Key topics of talk: Tiered approach for assessment</i>	Dr. Joop de Knecht, OECD

	<i>(EU); Ecotoxdata and criteria values: utility for tropical / Asian systems; how to implement – case example, hazard classification (PBT)</i>	
10:00	<b>BREAK</b>	
10:20	Regulation of metals in soils  <i>Key topics of talk: Sources of metals; development of soil criteria for ecological effects and applicability to APEC economies; wildlife toxicity and food chain effects</i>	Dr. Michael McLaughlin, CSIRO
10:50	Human health criteria and standards  <i>Key topics of talk: dose – response to criteria, soil and drinking water standards/criteria; internet sources of risk assessment information, consideration of dosimetry and particle size when setting occupational exposure limits (OELs) or ambient air standards, livestock and food chain issues</i>	Dr. Michael Dourson, University of Cincinnati
<b>Closing Discussion</b>		
11:30	Discussion, next steps and complete survey on needs for further training tools	Dr. Matthew Gredley, NICNAS Ms. Yvette Lowney, Exponent
12:00	<b>Adjournment</b>	

## **Appendix C**

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### **Biographies of Presenters**

## **Brief Biographies of Presenters**

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### **William Adams, Ph.D.**

General Manager, Legacy Management, Rio Tinto

Dr. Adams is currently General Manager for Rio Tinto and manages all of the company's global remediation programs. He was previously Director of Product Stewardship at Rio Tinto and also Director of Environmental Science for six years at Kennecott Utah Copper, Salt Lake City, Utah. Dr. Adams responsibilities include managing site remedial programs, environmental research, ecological risk assessments and interface with regulators on science-based issues. Recent research interests include developing ecotoxicology risk assessment methods for metals, developing an approach for hazard assessment of metals, site-specific methodologies for water quality criteria for metals, and development of an alternative strategy for metals to replace the existing PBT (persistent, toxicity and bioaccumulation) approach. Dr. Adams has 100 + publications, several books and has published several papers on methods for assessing sediments, water and tissue concentrations. He was instrumental in developing the science supporting equilibrium partitioning theory (EqP) for non-polar organic substances. He has also published several papers in the area of water quality assessments. Dr. Adams was a member of the EPA Science Advisory Board (SAB) for 10 years and a member of the EPA Superfund National Advisory Committee for Environmental Policy and Technology. Bill was a recent recipient of the SETAC Founders Award and one of the founders of the Metals Advisory Group.

### **Michael Dourson, Ph.D., DABT, ATS**

Director, Toxicology Excellence for Risk Assessment (TERA) Center  
University of Cincinnati, College of Medicine

Dr. Dourson is Professor and Director of the Toxicology Excellence for Risk Assessment Center (the TERA Center) at the University of Cincinnati, College of Medicine. The mission of the TERA Center is to support the protection of public health by developing, reviewing and communicating risk assessment values and analyses; improving risk methods through research; and, educating risk assessors, managers, and the public on risk assessment issues. The TERA Center's predecessor, the nonprofit corporation Toxicology Excellence for Risk Assessment, developed partnerships among government, industry and other interested groups to address risk assessments of high visibility, such as formaldehyde, perchlorate, chloroform, and soluble nickel, and cooperative ventures such as the Voluntary Children's Chemical Exposure Program (VCCEP), the International Toxicity Estimates for Risk (*ITER*) database (available at the National Library of Medicine's ToxNet), and the Alliance for Risk Assessment (*ARA*). The TERA Center at the University of Cincinnati will continue this work.

Prior to directing the nonprofit TERA, Dr. Dourson held leadership roles in the U.S.

Environmental Protection Agency as chair of US EPA's Reference Dose (RfD) Work Group, charter member of the US EPA's Risk Assessment Forum and chief of the group that helped create the Integrated Risk Information System (IRIS). He has won numerous awards for his joint efforts, including the creation of IRIS. In 2003 he was selected for the Society of Toxicology's Arnold J. Lehman award for major contributions that improve the scientific basis of risk assessment. In 2007, he was elected as a Fellow of the Academy of Toxicological Sciences. In 2009, he was selected for the International Society of Regulatory Toxicology and Pharmacology's International Achievement Award in recognition of his outstanding contributions nationally and internationally to the advancement of regulatory science. In 2009,

he was also selected as a Fellow for the Society for Risk Analysis for substantial achievement in science relating to risk analysis and service to SRA.

Dr. Dourson has co-published more than 150 papers on risk assessment methods, use of animal and human data in the assessment of risk, or assessments for specific chemicals. He has also co-authored well over 100 government risk assessment documents, made well over 100 invited presentations, and has chaired well over 100 sessions at scientific meetings and independent peer reviews, including peer review panels for US EPA IRIS assessments, US EPA's Risk Assessment Forum, TERA's International Toxicity Estimates for Risk (*ITER*) independent peer reviews and consultations, FDA's Science Board Subcommittee on Toxicology, the NSF International's Health Advisory Board, and SOT's harmonization of cancer and non-cancer risk assessment. He has been elected to multiple officer positions in the American Board of Toxicology, the Society of Toxicology (SOT), and the Society for Risk Analysis. In addition to numerous appointments on government panels, such as EPA's Science Advisory Board, he is also a media resource specialist in risk assessment for the SOT, member on the editorial board of several journals, and vice chair of the NSF International Health Advisory Board.

**Daniel Krewski, Ph.D.**

Director, R. Samuel McLaughlin Chair for Population Health Risk assessment, University of Ottawa

Dr. Krewski is Professor and Director of the R. Samuel McLaughlin Centre for Population Health Risk Assessment at the University of Ottawa, where he is involved in a number of activities in population health risk assessment within the new Institute of Population Health. Dr. Krewski has also served as Adjunct Research Professor of Statistics in the Department of Mathematics and Statistics at Carleton University since 1984. Prior to joining the Faculty of Medicine at the University of Ottawa in 1998, Dr. Krewski was Director, Risk Management in the Health Protection Branch of Health Canada. While with Health Canada, he also served as Acting Director of the Bureau of Chemical Hazards and as Chief of the Biostatistics Division in the Environmental Health Directorate. Dr. Krewski obtained his Ph.D. in statistics from Carleton University and subsequently completed an M.H.A. at the University of Ottawa. His professional interests include epidemiology, biostatistics, risk assessment, and risk management.

Dr. Krewski is a Lifetime National Associate, U.S. National Academy of Sciences (2002); Chair, U.S. National Academy of Sciences Committee on Toxicity Testing and Risk Assessment (2004-2007); Chair, U.S. National Academy of Sciences Committee on Acute Exposure Guidelines for Highly Hazardous Substances (1998-2004); Member, U.S. National Academy of Sciences Board on Radiation Effects Research (2002-present); Member, U.S. National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR VII, 2000-present; BEIR VI, 1994-1999); Chair, Royal Society of Canada Expert Panel on the Potential Health Risks of Radiofrequency Fields from Wireless Telecommunications Devices ((1998-1999); Member, U.S. National Academy of Sciences Board on Environmental Studies and Toxicology (1996-2002); Member, Scientific Council of the International Agency for Research on Cancer (1992-1996); Fellow, Society for Risk Analysis (1993); Fellow, American Statistical Association (1990).

Dr. Krewski's research interests include environmental and occupational epidemiology, biostatistics and population health risk assessment.

**Yvette Lowney, M.P.H.**

Senior Managing Scientist

Ms. Lowney has over 20 years of professional experience assisting clients and conducting research in the assessment of exposure and risks from chemicals in environmental media and consumer products. She has conducted risk assessments under CERCLA, RCRA, FIFRA, CPSIA, and state-led regulatory contexts involving a wide range of chemicals and exposure scenarios. In each of these contexts, a consistent goal is to identify strategic data gaps, and if needed, to conduct research to provide information for more realistic evaluation of exposures. Ms. Lowney assists clients in negotiating with regulatory agency representatives to resolve issues related to human exposure to toxic substances.

In the context of conducting risk assessments for contaminated sites, Ms. Lowney has designed and coordinated original research regarding the bioavailability of metals and organic chemicals from soils. This research included assessment of the relative oral bioavailability and percutaneous absorption, and generating bench-top extraction models for estimating the relative bioavailability of chemicals from soil, for application in both human health and ecological risk assessments. Results from this research have been presented at professional-society meetings, as testimony before scientific advisory panels, and in peer-reviewed publications. Ms. Lowney has been an invited speaker at symposia on bioavailability hosted by the California EPA, SERDP, Health Canada, and SBRP; has provided peer consultation on bioavailability research undertaken by ESTCP; and has participated in a peer-review panel of EPA guidance regarding the bioavailability of metals in soil for use in human health risk assessment.

In addition to site-specific evaluations, Ms. Lowney has broad experience in the risk evaluation of consumer products. This includes evaluation of exposures and risks associated with the presence of pesticides or toxic chemicals in building products, testing of various toys and consumer products to assess the potential for exposure to toxic chemicals during consumer use, and evaluation of alternative formulations during product development. These efforts have been undertaken to provide strategic advice to clients regarding the need for product labeling or recall and to generate specific data to address issues raised by consumer advocates or during due diligence associated with product development or distribution

**Michael McLaughlin, Ph.D.**

Science Fellow, CSIRO and Professorial Research Fellow, University of Adelaide

Dr. McLaughlin is a Science Fellow in Australia's Commonwealth Scientific and Industrial Research Organisation (CSIRO) and a Research Professor in Soil Science at the Waite Campus of the University of Adelaide. Dr. McLaughlin has more than 30 years of experience in soil fertility and plant nutrition research, covering Africa, Australia and southeast Asia. His research now has a global impact and coverage through the establishment of The University of Adelaide Fertiliser Technology Research Centre. Dr. McLaughlin's research interests include soil and environmental chemistry, fertiliser formulations and crop nutrition, the behaviour and toxicity of nutrients and contaminants in the soil-plant system, the assessment and remediation of contaminated soils, and use of advanced techniques to measure and monitor nutrients and pollutants in the environment. Dr. McLaughlin's research is also characterized by the using of new methods to examine fertilizer behaviour and effectiveness, such as isotope tracing and dilution methods to determine the fate of added fertilizer and to benchmark improvements in crop nutrition effectiveness.

**Joop de Knecht, Ph.D.**

Senior Policy Analyst, OECD

Joop de Knecht joined the Dutch National Institute of Public Health and the Environment in 1997 where he became an expert in the area of (eco)toxicology and risk assessment, and chemicals legislation. He got involved in the preparation and peer-review of risk assessment reports of various type of chemicals (including metals), and in projects dealing with the development of tools for risk assessment. He has been member of expert groups of several international organisations. In 2012 he joined the OECD where he is now in charge of the OECD Chemical Hazard and exposure Programme and the OECD Project on (Quantitative) Structure Activity Relationships.

**Adriana Oller, Ph.D.**

Senior Toxicologist, NiPERA

Dr. Oller is originally from Argentina where she obtained a Master in Biochemistry from Buenos Aires University in 1980. In 1983 after completing a two-year residency in Toxicology and Forensic Chemistry at the School of Pharmacy and Biochemistry (Buenos Aires University), she emigrated for the United States where she completed a Ph.D. in Genetic Toxicology at the Massachusetts Institute of Technology (Cambridge, MA) in 1989.

Dr. Oller continued genetic toxicology research on spontaneous mutations and DNA repair at the Lineberger Cancer Research Center in Chapel Hill and NIEHS in Research Triangle Park (North Carolina). In 1994, she joined the staff of the Nickel Producer Environmental Research Association (NiPERA, Inc.). During the last 21 years Dr. Oller has helped manage the human health research program for NiPERA, with particular emphasis on the mutagenicity and carcinogenicity effects of nickel and has been responsible for representing NiPERA at scientific and regulatory meetings worldwide.

Dr. Oller has participated in several experts panels including the 12th Task Force on Harmonisation of Classification and Labelling: Expert Group on Carcinogenicity. Adriana served as a member of JEM's editorial board from 2004 until 2006. She was co-editor of the column Metals in Perspective. This column featured articles of general interest related to health or environmental effects of metals and issues of risk assessment and risk management. Eleven issues of Metals in Perspective were published between 2003 and 2005. Dr. Oller became a Board Certified Toxicologist (Diplomat of the American Board of Toxicology- D.A.B.T.) in 1997 and successfully completed the recertification testing in 2002, 2007, and 2012. She is a fellow of the Royal Society of Chemistry. During her tenure at NiPERA Dr. Oller co-authored many peer-reviewed papers on nickel toxicology.

**Visitacion Antonio, MD.**

Head of Northern NCR Poison Control Center

Head, Northern NCR Poison Control Center - East Avenue Medical Center

Quezon City, Philippines

Dr. Antonio obtained her degree on Bachelor of Science in Biology from the University of Santo Tomas in 1985 after which she pursued her Doctor of Medicine at the Far Eastern University-Nicanor Reyes Medical Foundation then had her Residency Training in Pediatrics at East

Avenue Medical Center. In 1995, after passing the Specialty Board Examination in Pediatrics, she underwent Fellowship Training in Toxicology at the University of the Philippines-Philippine General Hospital National Poison Management and Control Center as a scholarship grant from the Department of Health. She also had a Masteral in Management Major in Hospital Administration from the Philippine Christian University.

Dr. Antonio is the Head of the Northern NCR Poison Control Center based at East Avenue Medical Center which caters to patients from the North side. She responded to several chemical incidents in the country and acted as a team leader of the Advanced Medical Team and member of the Sub-Task Force Hazmat. She also participated in several environmental and health assessment activities of the Department of Health. As a Pediatrician and Toxicologist, she encourages resident physicians to conduct community based researches on environment especially concerning exposure to different toxicants thru the Department of Health funding assistance and serves as an adviser on these researches.

Dr. Antonio, aside from being a consultant of the Department of Health and a professor, is also a member of the Philippine Society of Clinical And Occupational Toxicology since 2000 and served as the President from 2011-2012.

**Randall Wentsel, Ph.D.**

Senior Managing Scientist, Exponent

Dr. Wentsel has over 30 years of experience in environmental sciences in areas including: sediment, aquatic, and terrestrial toxicology; ecological risk assessment; research strategies; and science policy. Dr. Wentsel has authored over 30 open literature publications, 70 government publications, and various book chapters addressing state-of-the-art techniques and environmental toxicology and risk assessment issues. He co-led the Environmental Protection Agency (EPA) Framework for Metals Risk Assessment and a White House Committee for Environment and Natural Resources (CENR) document on Ecological Risk Assessment in the Federal Government, and a DoD Tri-service guidance on Ecological Risk Assessment.

Dr. Wentsel has served in several Federal government positions. He was the National Program Director (NPD) for Contaminated Sites/Resource Conservation in the EPA's Office of Research and Development (ORD), where he provided scientific direction of the program, strategic planning, and documentation of research impacts and applications. In the EPA Office of Water, Dr. Wentsel was a Branch Chief and supervised a staff addressing nutrient criteria, biosolids issues, and sedimentation criteria. Working for DoD, Dr. Wentsel managed research activities in ecological risk assessment, aquatic and terrestrial toxicology and biotechnology at the U.S. Army. He also served for one year as the science fellow on the US Senate Environment and Public Works Committee. Dr. Wentsel has been active in various peer review panels, advisory committees, and technical workshops and served for six years on the Society of Environmental Toxicology and Chemistry Board of Directors.

At Exponent, Dr. Wentsel co-led a workshop on soil metals criteria which resulted in a special series in *Integrated Environmental Assessment and Management*. Other projects have addressed contaminated sediments and life cycle assessment.

**Janith Wickramaratna, Ph.D.**

Senior Regulatory Scientist, NICNAS

Dr Janith Wickramaratna is a Senior Regulatory Scientist in the Existing Chemicals Program of the National Industrial Chemicals Notification and Assessment Scheme (NICNAS) within the Australian Government Department of Health and Ageing. He has over 10 years of experience in government regulation of industrial chemicals. At NICNAS he is a project manager on a major reform initiative that will screen the large number of unassessed chemicals on the Australian Inventory of Chemical Substances. In addition to undertaking assessments he has represented Australia at the OECD High Production Volume (HPV) Program meetings. He has a Doctor of Philosophy degree in Pharmacology and an Honours Degree in Bachelor of Sciences (Biomedical) from Monash University, Australia. He also holds a Master of Professional Accounting degree from University of Southern Queensland and a Graduate Certificate in Public Sector Management from the Flinders University.

## **Appendix D**

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### **Attendance List**

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Dr</b>	Shono	Fumiaki	APEC CD Co-Chair	Observer	Japan Chemical Industry Association	Executive Director
<b>Mr</b>	Urquiza	Rodrigo	APEC MTF	Observer	Chilean Copper Commission	Head - international Affairs unit
<b>Prof</b>	McLaughlin	Mike	Australia	academia	CSIRO Land and Water	
<b>Dr</b>	Wickramaratna	Janith	Australia	government	Department of Health	Senior Regulatory Scientist
<b>Mr</b>	Matheson	Richard	Australia	industry	Nickel Institute	Coordinator - Asia
<b>Dr</b>	Gredley	Matthew	Australia	Organiser	NICNAS	Principal Scientist
<b>Dr</b>	Steukers	Veronique	non-APEC Belgium	industry	Nickel Institute	Director H&E Public Policy
<b>Prof</b>	Krewski	Dan	Canada	academia	McLaughlin Centre for Population Health Risk Assessment, University of Ottawa	Director
<b>Dr</b>	Huntsman- Mapila	Philippa	Canada	government	CANMET	
<b>Mr</b>	Cantalops	Jorge	Chile	government	Chilean Copper Commission	Director of Research and Policy Planning Division
<b>Prof</b>	Perez Tapia	Elizabeth Marcela	Chile	government	Ministry of Environment	Engineer in Renewable Natural Resources

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Mr</b>	Du	Gang	China	government	China Solid Waste and Chemicals Management Center, Ministry of Environmental Protection	Engineer
<b>Ms</b>	Wu	Susu	China	government	Ministry of Environmental Protection	Officer
<b>Ms</b>	Tian	Aixia	China	industry	Nickel Institute Beijing Office	China H&E Public Policy Coordinator
<b>Mr</b>	Chang	Chin-Ming	Chinese Taipei	government	Ministry of Labor	Section Chief
<b>Mr</b>	Chen	Ming-Yuan	Chinese Taipei	government	Ministry of Labor	Technician
<b>Ms</b>	Tsai	Han-Hsuan	Chinese Taipei	government	SAHTECH	Associate Researcher
<b>Ms</b>	Wu	Chao-Wei	Chinese Taipei	government	SAHTECH	Associate Engineer
<b>Mr</b>	Ota	Miho	Japan	government	Ministry of Finance	Official
<b>Mr</b>	Aito	Kazakuni	Japan	industry	Japan Chemical Industry Association	General Manager, Chemicals Management Department
<b>Mr</b>	Tsuyuguchi	Seiichi	Japan	industry	Nickel Institute	General manager, Tokyo office

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Mr</b>	Kondou	Yasuhiro	Japan	industry	Sumitomo Metal Mining Company Lt	General Manager, Safety and Environmental Control Department
<b>Mr</b>	Hoshi	Yukihiro	Japan	industry	Sumitomo Metal Mining Company Ltd Safety and Environmental Control Development	General Manager
<b>Dr</b>	Yu	Gyung-Hee	Korea	government	Ministry of Trade, Industry and Energy	Senior Researcher
<b>Mr</b>	Abdul Malik	Abdul Mazli Hafiz	Malaysia	government	Department of Environment	Assistant Director
<b>Ms</b>	Kamarulzaman	Thahirah	Malaysia	government	Department of Environment	Principal Assistant Director
<b>Ms</b>	Mohd Sharif	Shabanon	Malaysia	government	Ministry of Human Resources	Factories and Machineries Inspector
<b>Ms</b>	Omar	Azreen Shazwani	Malaysia	government	Ministry of Human Resources	Factories and Machineries Inspector

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Mr</b>	Mohd Hanafiah	Mohd Khairi	Malaysia	government	Ministry of International Trade and Industry	Senior Assistant Director
<b>Mr</b>	Yiin	Terence	Malaysia	industry	Glencore International	Trader
<b>Mr</b>	Ranpura	Shrenik	non-APEC India	industry	GE Corporation	Senior Expert - Health and Safety, ASEAN/India, Japan and South Korea Region
<b>Dr</b>	de Knecht	Joop	non-APEC OECD	government	OECD Cooperative Chemicals Assessment Programme	Principal Administrator
<b>Dr</b>	Davies	Ben	non-APEC UK	Organiser	ICMM	Manager, Materials Stewardship
<b>Ms</b>	Thankey	Meera	non-APEC UK	Organiser	ICMM	Program Officer
<b>Ms</b>	Quinto	Mari Jemma	Philippines	government	Department of Health	Engineer III
<b>Ms</b>	Rivera	Ana Trinidad	Philippines	government	Department of Health	Supervising Health Program Officer
<b>Mr</b>	Arcarmo	Albert	Philippines	government	Environmental Management Bureau	Senior Environmental Management Specialist

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Ms</b>	Caanacan	Jacqueline	Philippines	government	Environmental Management Bureau	OIC, Regional Director
<b>Mr</b>	Cruz	Renato	Philippines	government	Environmental Management Bureau	Chief, Environmental Quality Division
<b>Mr</b>	Cuñado	William	Philippines	government	Environmental Management Bureau	OIC – Regional Director
<b>Ms</b>	Gallego	Angelica Anne	Philippines	government	Environmental Management Bureau	Environmental management Specialist II
<b>Ms</b>	Lanto	Ma. Socorro	Philippines	government	Environmental Management Bureau	Regional Director - DENR 12
<b>Ms</b>	Maceda	Letecia	Philippines	government	Environmental Management Bureau	OIC-Regional Director
<b>Mr</b>	Maleon	Jose Joel	Philippines	government	Environmental Management Bureau	Engineer
<b>Ms</b>	Mendoza	Emmanuelita D	Philippines	government	Environmental Management Bureau	OIC-Chief, Chemical Management Section
<b>Ms</b>	Otico	Perseveranda-Fe	Philippines	government	Environmental Management Bureau	Senior Environmental Management Specialist

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Ms</b>	Roble	Annabeth	Philippines	government	Environmental Management Bureau	Environmental management Specialist
<b>Ms</b>	Ruiz	Maria Leonie Lynn	Philippines	government	Environmental Management Bureau	Engineer
<b>Mr</b>	Sheen	Roberto	Philippines	government	Environmental Management Bureau	OIC-Regional Director
<b>Mr</b>	Siador	Cesar, Jr	Philippines	government	Environmental Management Bureau	Regional Director
<b>Mr</b>	Tamani	Roland Omar	Philippines	government	Environmental Management Bureau	Engineer II
<b>Ms</b>	Viernes	Arcely	Philippines	government	Environmental Management Bureau	Science Research Specialist
<b>Ms</b>	Parangan	Rochelle	Philippines	government	Food and Drug Administration	Food-Drug Regulation Officer
<b>Ms</b>	Perez	Thelma	Philippines	government	Food and Drug Administration	Food-Drug Regulation Officer
<b>Mr</b>	Noble	Glenn Marcelo	Philippines	government	Mines and Geosciences Bureau, Government of the Philippines	Chief, Planning, Policy and International Affairs Division

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Dr</b>	Antonio	Visitacion	Philippines	government	Northern NCR Poison Control Center	Head
<b>Mr</b>	Ryshkov	Dmitry	Russian Federation	industry	Norilsk Nickel Europe Ltd	Head of Marketing in Europe
<b>Ms</b>	Chow	Li Yee	Singapore	government	Ministry of Manpower	Sn. Assistant Director (Occ Hygiene)
<b>Mr</b>	van Dijk	Leendert	Singapore	industry	Eastman Chemical Asia Pacific	Manager
<b>Ms</b>	Yeung	Cissie	Singapore	industry	Shell Eastern Petroleum (Pte) Ltd	Manager
<b>Dr</b>	Khlangwiset	Pornsri	Thailand	government	FDA Thailand	Professional Pharmacist
<b>Ms</b>	Saksripanit	Pitchaya	Thailand	government	FDA Thailand	Pharmacist Practitioner Level
<b>Dr</b>	Dourson	Mike	USA	academia	Toxicology Excellence for Risk Assessment	Director
<b>Ms</b>	Burr	Alexa	USA	industry	American Chemistry Council	Manager
<b>Mr</b>	Liu	Andrew	USA	industry	Chemours Company	Global Regulatory Strategy Leader
<b>Ms</b>	Lowney	Yvette	USA	industry	Exponent	Senior Managing Scientist
<b>Mr</b>	Richter	Christian	USA	industry	Nickel institute	Principal Assistant Director
<b>Dr</b>	Oller	Adriana	USA	industry	Nickel Producers Environmental Research Association	Senior Human Health Toxicologist

<b>Title</b>	<b>Family name</b>	<b>Given name</b>	<b>Economy</b>	<b>Sector</b>	<b>Organisation</b>	<b>Position</b>
<b>Dr</b>	Wilke	Donald	USA	industry	P&G	Principal Scientist, Product Safety and Regulatory Affairs, Global Household Care
<b>Dr</b>	Adams	Bill	USA	industry	Rio Tinto	Chief Scientist & General Manager
<b>Dr</b>	Wentsel	Randall	USA	Organiser	Exponent	Senior Managing Scientist
<b>Mr</b>	Tien	Minh Hai	Vietnam	government	Vietnam Chemicals Agency	Officer

## **Appendix E**

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### **APEC Survey**



APEC  
PHILIPPINES  
2 0 1 5

ICMM  
International Council  
on Mining & Metals



## End-of Workshop Questionnaire

### APEC Risk Assessment Training on Metals and Metal Compounds

Nina Ballroom 1, Radisson Blu Cebu Hotel, Cebu, the Philippines  
28 (full day) / 29 (half day) August, 2015

(in association with the APEC Chemical Dialogue meeting, under the APEC Senior Officials Meeting (SOM3) and Related Meetings)

#### Introduction

This is a short questionnaire to seek your immediate views on:

- the usefulness of the Metals Risk Assessment Workshop and
- on-going tools that can be created for the sustainable delivery of capacity building in the risk assessment of metals and metal compounds.

As required by APEC, the Workshop Planning Committee will conduct a broader and more detailed electronic survey during December 2015 to January 2016 to gauge the extent to which the learnings from the Workshop have been useful to you, your colleagues, your organisation, and your economy. This electronic survey will also seek your views on further capacity building tools that your economy might create during 2016 and beyond.

The results of this short, paper-based survey and the more detailed, electronic survey, will be incorporated into the project Completion Report and published on the APEC Project database at <https://aimp2.apec.org/sites/PDB/Lists/Proposals/DispForm.aspx?ID=1566>

#### The Questionnaire

Name: \_\_\_\_\_

Economy: \_\_\_\_\_

Sector(tick one)  government  industry  academic

Email: \_\_\_\_\_ **Relevance**  
and organisation of Workshop

Please rate the following on a scale of 1 to 5 (or not applicable “NA”) Where 5 means you strongly agree, and 1 means you strongly disagree

- \_\_\_\_ the training was at the advanced technical level
- \_\_\_\_ I will be able to apply the knowledge I learnt to my job
- \_\_\_\_ breakout sessions provided adequate, hands-on training
  
- \_\_\_\_ training materials were distributed with enough time before the event.

Breakout session attended:

AM: \_\_\_\_\_

PM: \_\_\_\_\_

How do you rate the training overall? On a scale of 1-5: Excellent (5) thru to very poor (1): \_\_\_\_\_

Comments: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

How could the relevance and/or organisation of the training be improved?

\_\_\_\_\_  
\_\_\_\_\_

### **Creation of ongoing training tools**

The next Phase of the project, occurring from September to December 2015, will create and deliver on-going training tools that will incorporate the materials used in the Workshop. Individual economies can also create further tools for use in 2016 and beyond based on their particular needs.

In particular, the Planning Group plans to deliver three webinars for delivery in early October, September, and December 2015.

Apart from webinars, please rate the likely usefulness of the following tools to be produced in 2015 (On a scale of 1-5, where 5 is “strongly agree” and 1 is “strongly disagree” (or NA if not applicable):

- \_\_\_\_ fact sheets
- \_\_\_\_ technical documents

- \_\_\_\_ other (please fill in below)

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Which of the following topics in the table at the back of this survey and covered by this Workshop do you think could be developed into webinars, fact sheets or technical documents?

If you don't have time to fill out this table, please feel free to indicate your preference below and specify which type of tool (factsheets, technical documents, other) would be most suitable.)

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### Next steps

1. \_\_\_\_ Do you see a need for even more detailed, hands-on training in specific topics covered by the workshop? Such training would most likely need to be delivered on a regional rather than APEC-wide basis (Scale of 1-5 where 5 is strongly agree and 1 is strongly disagree (or not applicable "NA").

*Please cite specific areas of technical interest....*

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2. Are there other areas of training in chemical risk assessment / management / communications / inventory management etc. that you would like the APEC Chemical Dialogue's Regulators' Forum to provide?

*Please cite specific areas of technical interest....*

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THANK YOU FOR YOUR PARTICIPATION

Should you wish to discuss any of these matters further, please contact:  
Dr. Matthew Gredley, Project Overseer, [matthew.gredley@nicnas.gov.au](mailto:matthew.gredley@nicnas.gov.au), or  
Mr. Ben Davies, Industry Coordinator, [benjamin.davies@icmm.com](mailto:benjamin.davies@icmm.com)

Please check all that apply:

<b>Topic</b>	<b>Webinars</b>	<b>Fact sheets</b>	<b>Technical documents</b>	<b>Other (please provide brief comment)</b>
Unique aspects of metals and inorganic metal compounds in environmental and human health risk assessments				
<b><i>Environment</i></b>				
Fate, transport and aquatic chemistry of metals				
Aquatic toxicity of metals				
Soil bioavailability				
<b><i>Human health</i></b>				
Risk assessment and hazard identification of metals				
Key exposure pathways				
Bio-elution-based approaches for metals				
Oral bioavailability of metals in soil				
<b><i>Regulatory standards for metals</i></b>				
Regulation of metals in aquatic systems				
Regulation of metals in soils				
Human health criteria and standards				