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Chemicals Management Plan Science Committee Mid-term Progress Report

January 10 – November 29, 2018

On this page

1. Purpose

The purpose of the Chemicals Management Plan (CMP) Science Committee Mid-term Progress Report is to summarize CMP Science Committee meetings and their outcomes for interested stakeholders and the public.

2. Scope

This mid-term progress report summarizes the first 3 meetings of the second term of the CMP Science Committee (hereafter referred to as the committee). These meetings took place in Ottawa, Ontario (Canada) in January 2018, July 2018, and November 2018 respectively.

This mid-term progress report represents the status and opinions of the committee members (both core and *ad hoc*) at the time they were presented and discussed at the various meetings; since then, progress/advances in science may have been made.

3. Message from the co-chairs

We would like to begin by expressing our sincere thanks to the core and *ad hoc* members of the committee for their contributions since the first meeting of the second term in January 2018. An ongoing strength of the committee is the informed, innovative, and highly stimulating deliberations and debates during the meetings, and email communications while preparing for the meetings and during the creation of the final committee reports. The committee worked diligently to provide thoughtful, scientifically up-to-date, and timely input to the Government of Canada. Committee members are internationally renowned experts in their fields and have multiple appointments, including those in the academies and research institutions. As such, we would like to recognize the substantial personal commitment in time and energy of the core and *ad hoc* members to review, reflect, and ultimately ensure that optimal consideration to the

subject matter was always given. The resulting output are comprehensive reports to Health Canada (HC) and Environment and Climate Change Canada (ECCC) (hereafter referred to as the departments) regarding the delivery of the CMP today, as well as considerations for CMP post-2020. A particular highlight for the committee was seeing how the departments shared and used the committee input – both internally and externally through the different publication and information-sharing portals. Effective communication and outreach to the public and other stakeholders remains paramount and we are pleased to see ongoing efforts made to facilitate this process. To this end, the co-chairs wish to thank and recognize the Directors and Directors General of the Existing Substances Risk Assessment Bureau (HC) and the Ecological Assessment Division (ECCC) for their leadership and vision. We also thank the CMP Secretariat (HC) for its tireless logistics support ensuring committee processes run smoothly and recognizing that all members of the departments have contributed to the committee's work with great dedication.
The committee is truly an integrated team effort, and we are grateful to members and government representatives alike for all of their hard work, dedication, and commitment.

Miriam Diamond and Geoff Granville

4. Mandate of the external committee

The mandate of the CMP Science Committee is defined in the committee terms of reference as:

"*The committee will contribute expertise to the departments pertaining to scientific considerations moving forward under the CMP. These departments have the responsibility and sole authority to make decisions informed by input provided by the committee.*"

For information on the roles and responsibilities of the committee, the executive secretary and the secretariat, view the CMP Science Committee terms of reference.

5. External committee membership

Nine core members comprise the committee who collectively have comprehensive expertise in key scientific areas such as environmental and/or biological science and engineering, chemicals management frameworks, weight of evidence and precaution,

and knowledge of the chemicals industry. The areas of expertise for members were updated for term 2 to reflect the need for greater expertise in areas such as cancer risk assessment methodology, endocrinology, and risk assessment of chemical mixtures, aggregate and cumulative risk assessment, multimedia fate assessment, and expertise in population health from an epidemiological or clinical perspective. Core members are appointed for a 3-year term.

Once the topic for a committee meeting has been determined, experts in the field may also be invited as *ad hoc* members to contribute their expertise to the meeting deliberations and writing of the final report. These *ad hoc* members are leading international experts on the topic under discussion.

The following section lists the names of the committee members, along with their biographies, and their tenure on the committee. To maintain openness and transparency, all members of the committee disclose affiliations and interests, including any direct or indirect financial interests and other affiliations and interests that relate to the mandate of the committee. These might include investments in companies, current employment, research support, grants, contributions, board memberships, professional/scientific societies, and so forth. Summaries of the affiliations and interests for the core members are available.

Dr. Jon Arnot

Biography

Dr. Arnot is the President of ARC Arnot Research & Consulting and an adjunct professor in the Department of Physical and Environmental Science and in the Department of Pharmacology and Toxicology at the University of Toronto. He has 17 years of research experience in the development, application, and evaluation of databases, methods, and models to assess the exposure, hazard, and risk of organic chemicals to humans and the environment. His research has focused on the application of high-throughput screening methods for prioritizing chemicals for risk assessment. He is the principal investigator or co-investigator of various international projects including collaborations in the United States (U.S.), Europe, and Canada. Dr. Arnot served on the National Academies of Sciences, Engineering, and Medicine Committee on incorporating 21st Century Science into Risk-Based Evaluations. He was the recipient of the James M. McKim III Innovative Student Research Award (2008) from the International Quantitative Structure-Activity Relationship (QSAR) Foundation to Reduce Animal Testing and the Society of Environmental Toxicology and Chemistry Best Student Paper Award (2009). Dr. Arnot

holds a PhD in Environmental and Life Sciences from Trent University, an MSc from Simon Fraser University, and a BSc from the University of Alberta.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Jon Arnot President, ARC Arnot Research & Consulting	None	Recipient of grants funded by several government departments, programs, and jurisdictions Recipient of grants funded by industry and not-for-profits in several jurisdictions	Member and/or Co-chair: • Society of Toxicology (SOT) • American Chemical Society • U.S. National Academy of Sciences Committee (Incorporating 21st Century Science into Risk-Based Evaluations) • International Society of Exposure Science • Society of Environmental Toxicology and Chemistry Bioaccumulation Science Advisory Group • ILSI-HESI Bioaccumulation Workgroup • Society of Environmental Toxicology and Chemistry

1. Investments in companies, current employment, partnerships, equity, royalties, joint ventures, trusts, real property, stocks, shares, bonds.
2. Research support, grants, contributions, fellowships, personal education, sponsorships, contracts, past employment, consulting, teaching, speaking and writing engagements, honoraria, and travel and accommodation costs (within the last 5 years).
3. Board membership, executive or non-executive directorship, expert testimony, advisory committee, professional/scientific societies, trade associations, public interest/advocacy, or civic groups.

Time on external committee for second term

September 2017 – Present

Dr. Niladri Basu

Biography

Dr. Basu is an Associate Professor in the Faculty of Agricultural and Environmental Sciences at McGill University where he holds a Canada Research Chair in Environmental Health Sciences. He is jointly appointed in the Department of Natural Resource Sciences and the School of Human Nutrition and is also a member of the Department of Epidemiology, Biostatistics, and Occupational Health at the McGill School of Environment. Prior to joining McGill in 2013, Dr. Basu was an Assistant Professor at the University of Michigan School of Public Health where he now holds an Adjunct Professorship. Among several activities, he is an Associate Editor of *Environmental Toxicology and Chemistry*, active within the Society of Environmental Toxicology and Chemistry, and involved with the United Nations (UN) Global Mercury Partnership. Dr. Basu holds a PhD in Wildlife Biology from McGill University, an MSc from the University of British Columbia, and a BSc from Queen's University.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Niladri Basu Associate Professor, McGill University, Department of Natural Resource Sciences	None	Recipient of several federally funded grants, as well as an academic and a not-for-profit grant	Member and/or sub-group Lead: • Society of Environmental Toxicology and Chemistry • SOT • International Union for Conservation of Nature Commission on Environmental, Economic and Social Policy • Dental Amalgams and Composites Team, Canadian Agency for Drugs and Technologies in Health • ILSI-HESI Genomics Committee • UN Environment Programme

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
			Global Mercury Assessment Editor: • *Environmental Toxicology and Chemistry* Commissioner: • Lancet Commission on Pollution and Health

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Time on external committee for second term

September 2017 – Present

Dr. Richard Becker

Biography

Dr. Becker is a Senior Director at the American Chemistry Council (ACC). He joined the ACC in 1999. Dr. Becker leads the ACC's Science and Research Division and directs the Long-Range Research Initiative, which focuses on catalyzing innovations for toxicity testing, exposure science, and safety assessments in the 21st century. Before joining the ACC, he served as a senior scientist with the State of California from 1987 to 1999. He is a Diplomat of the American Board of Toxicology. Dr. Becker has been an active member of the SOT for 25 years. He is also a member of the Society for Risk Analysis, the International Society for Regulatory Toxicology and Pharmacology, and the American Chemical Society. In 2014, Dr. Becker was appointed to the Board on Environmental Studies and Toxicology of the National Research Council. Dr. Becker received the Arnold

Lehman Award from the SOT in 2015 in recognition of his contributions to the field of risk assessment and the regulation of chemicals. Dr. Becker holds a PhD in pharmacology and toxicology from the University of California and a BA in Chemistry from Swarthmore College.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Richard Becker Senior Toxicologist, American Chemistry Council (ACC)	None	Leads American Chemistry Council Long-Range Research Initiative	Member: • SOT • American Chemical Society • Society for Risk Analysis • International Society of Regulatory Toxicology and Pharmacology • Board of Environmental Studies and Toxicology, U.S. National Academies of Science, Engineering and Medicine • U.S. Environmental Protection Agency's (EPA) Board of Scientific Counselors, Chemical Safety for Sustainability Subcommittee Trustee of the Foundation for Chemistry Research and Initiatives Employed by the American Chemistry Council, a trade association of U.S. chemical manufacturers

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]

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2. Research support, grants, contributions, fellowships, personal education, sponsorships, contracts, past employment, consulting, teaching, speaking and writing engagements, honoraria, and travel and accommodation costs (within the last 5 years).

3. Board membership, executive or non-executive directorship, expert testimony, advisory committee, professional/scientific societies, trade associations, public interest/advocacy, or civic groups.

Time on external committee for second term

September 2017 – Present

Dr. Weihsueh Chiu

Biography

Dr. Weihsueh A. Chiu is a professor in the Department of Veterinary Integrative Biosciences in the College of Veterinary Medicine and Biomedical Sciences at Texas A&M University. Before joining the university in 2015, he worked at the U.S. EPA for over 14 years. Throughout his career, he has been involved in a diverse span of risk-related topics, such as defense against chemical-biological warfare agents, radioactive contamination in biosolids, human health risks from environmental chemical exposures, and the interface between science and policy. His recent research has focused on human health risk assessment, particularly with respect to toxicokinetics, mechanisms of toxicity, physiologically based pharmacokinetic modelling, dose-response assessment, characterizing uncertainty and variability, systematic review, and meta-analysis. Dr. Chiu has served on a variety of expert advisory committees for U.S. federal, state, and Canadian government agencies; the U.S. National Academies of Sciences, Engineering, and Medicine; the World Health Organization; and the Organization for Economic Cooperation and Development. Dr. Chiu received an AB in Physics from Harvard University, a MA and PhD in Physics from Princeton University, and a Certificate in Science, Technology, and Environmental Policy from the Woodrow Wilson School of Public and International Affairs.

Affiliations and Interests

Member	Direct Financial Interests[1]	Indirect Financial Interests[2]	Individual or Organizational Affiliations[3]
Dr. Weihsueh Chiu Professor, Texas A&M University, Department of Veterinary Integrative Biosciences	Previous U.S. EPA employee Temporary Contractor to KS and Associates LLC (federally funded through STTR grant) Temporary consultant to Risk Sciences International	Recipient of several federally funded grants Subcontractor for state level, federal, and international jurisdictions Reimbursement for international travel related work	Member and/or Chair: • SOT • SOT Contemporary Concepts in Toxicology Committee • Society for Risk Analysis (SRA) • SRA Dose Response Speciality Group

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Time on external committee for second term

September 2017 – Present

Elaine Cohen Hubal

Biography

Dr. Cohen Hubal has held a number of positions at the U.S. EPA, including her present role as Senior Science Advisor, National Exposure Research Laboratory, Office of Research and Development. Currently, she is also Editor-in-Chief of *The Journal of Exposure Science and Environmental Epidemiology*. Dr. Cohen Hubal has served as an expert on a variety of scientific panels and committees, including currently as a member of the California Department of Toxic Substances Control's Green Ribbon Science Panel. She has also served as a core member of the Voluntary Children's Chemical Evaluation Program Peer Consultation, the Study Design Working Group for the National Children's Study, and as chair of the World Health Organization International Programme on Chemical Safety working group on "Identifying Important Life Stages for Monitoring and Assessing Risks from Exposures to Environmental Contaminants." She

was a member of the Government of Canada's CMP Science Committee during the first term (2013–2017). Dr. Cohen Hubal holds a PhD in Chemical Engineering from North Carolina State University.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Elaine Cohen Hubal Senior Science Advisor, National Exposure Research Laboratory, Office of Research and Development, U.S. EPA	Contract with Springer Nature	None	None

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Time on external committee for second term

September 2017 – Present

Dr. Miriam Diamond (co-chair)

Biography

Dr. Diamond is a professor in the Department of Earth Sciences at the University of Toronto and is cross-appointed to the Department of Chemical Engineering and Applied Chemistry, the Dalla Lana Faculty of Public Health, the School of the Environment, Department of Geography and Planning, and the Department of Physical and Environmental Sciences at Scarborough College. Dr. Diamond was the Co-chair of the Ontario Ministry of the Environment's Toxics Reduction Scientific Expert Panel and the Ontario Ministry of the Environment's Multi-Stakeholder Panel on the "Living List" of the *Toxics Reduction Act*. She is an Associate Editor of the journal *Environmental Science and Technology*, on the editorial advisory boards of the *Journal of Exposure Science and Environmental Epidemiology* and *Emerging Contaminants*. Dr. Diamond is a member of

the Board of Directors of the Canadian Environmental Law Association and a member of the Science Advisory Board of Environmental Defence. She is a Fellow of the Society of Environmental Toxicology and Chemistry (SETAC), a Fellow of the Canadian Geographical Society, and was named Canadian Environmental Scientist of the Year in 2007 by that society. She was a member of the Government of Canada's CMP Science Committee during the first term (2013-2017). Dr. Diamond has a PhD in Chemical Engineering from the University of Toronto.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Miriam Diamond Professor, University of Toronto, Department of Earth Sciences	Contract with American Chemistry Society as Associate Editor of *Environmental Science and Technology* Member of the Advisory Panel of Emerging Contaminants Workgroup for the Regional Monitoring Program for Water Quality in San Francisco Bay, San Francisco Estuary Institute	Recipient of several provincial and federally funded grants Received honoraria for peer review and meeting attendance	Board of Directors Member: • Canadian Environmental Law Association Member: • SETAC • American Chemistry Society • International Association for Great Lakes Research • International Society of Exposure Science (ISES) Previous faculty member: • Haus der Kulteren der Welt, Berlin

1. Investments in companies, current employment, partnerships, equity, royalties, joint ventures, trusts, real property, stocks, shares, bonds.

2. Research support, grants, contributions, fellowships, personal education, sponsorships, contracts, past employment, consulting, teaching, speaking and writing engagements, honoraria, and travel and accommodation costs (within the last 5 years).

3. Board membership, executive or non-executive directorship, expert testimony, advisory committee, professional/scientific societies, trade associations, public interest/advocacy, or civic groups.

Time on external committee for second term

September 2017 – Present

Dr. Michelle Embry

Biography

Dr. Embry is the Associate Director of Environmental Sciences at the Health and Environmental Sciences Institute (HESI). Prior to joining HESI in 2006, she was an ecological risk assessor at the U.S. EPA's Office of Pesticide Programs. She has expertise in both human health and ecotoxicology, with an emphasis on integrated approaches and alternative methods. Her current project portfolio includes the HESI Bioaccumulation and Animal Alternatives in Environmental Risk Assessment Technical Committees, 2 of HESI's projects aimed at improving ecological risk assessment. Dr. Embry's work also includes the Risk Assessment in the 21st Century (RISK21) Project, which developed a scientific, transparent, and efficient approach for human health risk assessment, including a web-based tool that has led to outreach and training activities on risk assessment approaches worldwide. She was an elected member of the SETAC North America Board of Directors (2014–2017), past-chair of the SETAC Global Partners Advisory Committee (2014–2017), and a member of the SETAC Bioaccumulation and Animal Alternatives Advisory Group Steering Teams. Dr. Embry holds a PhD in Toxicology, as well as a BSc in Biology and Environmental Science & Policy from Duke University.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Dr. Michelle Embry Associate Director, Environmental Science, HESI	Current employee of HESI	Recipient of several federally funded grants Financial contribution from industry to employer (HESI)	Member: • SOT • International Society of Exposure Science • SETAC

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
			Member, Board of Directors and/or Executive Committee (past): • SETAC (Board of Directors) • Society for the Advancement of Adverse Outcome Pathways • European Centre for Ecotoxicology and Toxicology of Chemicals Task Force on Information to be considered in a weight-of-evidence-based PBT/vPvB assessment of chemicals Participant: • Interagency Coordinating Committee on the Validation of Alternative Methods *In Vitro* to *In Vivo* Extrapolation Working Group • Organization for Economic Co-operation and Development (OECD) Expert Group on "Guidance Document on the Characterisation, Validation and Reporting of Physiologically-Based Models for Regulatory Applications" • OECD Project 3.13 Expert Group on "New Test Guidelines for *in vitro* Fish Hepatic Metabolism" (past)

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3. Board membership, executive or non-executive directorship, expert testimony, advisory committee,

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
professional/scientific societies, trade associations, public interest/advocacy, or civic groups.			

Time on external committee for second term

September 2017 – Present

Mr. Geoff Granville (co-chair)

Biography

Following his retirement in 2006 from the position of Toxicology and Product Stewardship Manager at Shell Canada, Mr. Granville has worked as a private consultant with expertise in environmental and population health. At Shell Canada, his responsibilities centered on occupational and environmental health issues relating to chemical substances, including toxicity testing, health risk assessments, and regulatory compliance. He is an adjunct professor at the University of Alberta and (previously) the University of Toronto. In 1991, he took on the role of Associate Director within Health Canada's Environmental Health Directorate in Ottawa as part of a 2-year executive exchange program. Mr. Granville has participated on many committees; examples include membership of the Science Management Committee of the (Federal) Toxic Substances Research Initiative, and participation as co-chair of the (Alberta) Human and Animal Health Team of the Clean Air Strategic Alliance. Mr. Granville was a member of the Government of Canada's Challenge Advisory Panel for the first phase of the CMP (from 2007 until 2011), and was co-chair of the first term of the CMP Science Committee (2013–2017). Mr. Granville has a BSc. in biochemistry and toxicology from the University of Surrey, United Kingdom.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Mr. Geoff Granville Consultant, Calgary, Alberta; and Adjunct professor, University of	Retired employee of Shell Canada	Recipient of a federally funded grant	Member and/or co-chair: • SOT • Government of Canada Challenge

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Alberta, Department of Laboratory Medicine and Pathology		Recipient of several industry-funded grants	Advisory Panel Participant: • Industry Coordinating Group for the *Canadian Environmental Protection Act* (CEPA)

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3. Board membership, executive or non-executive directorship, expert testimony, advisory committee, professional/scientific societies, trade associations, public interest/advocacy, or civic groups.

Time on external committee for second term

September 2017 – Present

Mr. Mike Rasenberg

Biography

Mr. Rasenberg is the Head of Computational Assessment at the European Chemicals Agency (ECHA). Chemicals management has been the central theme of his work since 1999. Mr. Rasenberg has broad experience in this area, ranging from hazard, exposure, and risk assessment of individual chemicals to leading activities to prioritize and address chemicals of concern or develop generic approaches and methods to assess chemicals. During this work, he has used and been exposed to alternative ways of hazard identification (alternative approaches). He has a leading role at ECHA in relation to the promotion and use of alternative test methods. Some examples include the development of the Read-Across Assessment Framework and the work on the OECD QSAR Toolbox. He represents the European Commission at the bureau of the OECD Working Party for Hazard Assessment. Mr. Rasenberg studied analytical chemistry and environmental chemistry at the Zuyd University of Applied Sciences in Limburg, The Netherlands.

Affiliations and interests

Member	Direct financial interests[1]	Indirect financial interests[2]	Individual or organizational affiliations[3]
Mr. Mike Rasenberg Unit Head, ECHA, Computational Assessment and Dissemination	None	None	Member: • OECD Working Party for Hazard Assessment

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Time on external committee for second term

September 2017 – Present

6. Meetings

6a. Topic: Informed substitution

January 10–11, 2018, Ottawa, Ontario.

6a (i). Attendees

Committee members:

- Dr. Jon Arnot
- Dr. Niladri Basu
- Dr. Richard Becker
- Dr. Weihsueh Chiu
- Dr. Miriam Diamond
- Dr. Michelle Embry
- Mr. Geoff Granville

- Dr. Elaine Cohen Hubal
- Mr. Mike Rasenberg

***Ad hoc* committee members:**

- Dr. Joel Tickner (University of Massachusetts Lowell)
- Dr. David Widawsky (U.S. EPA, Washington, DC)
- Dr. Meredith Williams (California EPA)

Government of Canada officials:

- David Morin [Director General, Safe Environments Directorate (SED), Healthy Environments and Consumer Safety Branch (HECSB), HC]
- Christine Norman [Director, Existing Substances Risk Assessment Bureau (ESRAB), HECSB, HC)]
- Shannon Castellarin [Manager, Chemicals Management, Environment Protection Branch (EPB), ECCC]
- Maya Berci [Director, New Substances Assessment and Control Bureau (NSACB), HECSB, HC]
- Andrew Beck [Director, Risk Management Bureau (RMB), HECSB, HC]
- Dr. Tara Barton-Maclaren (Research Manager, ESRAB, HECSB, HC)
- Dr. Andy Nong [Computational Toxicologist, Environmental Health Science and Research Bureau (EHSRB), Environment and Radiation Health Sciences Directorate (ERHSD), HECSB, HC]
- Mark Bonnell [Senior Science Advisor, Ecological Assessment Division (EAD), Science and Technology Branch, ECCC]
- Sarah Vanden Hoven (Science Advisor, ESRAB, HECSB, HC)
- Jake Sanderson **(**Manager, Program Development and Engagement Division, Science and Technology Branch, ECCC)

Secretariat:

- Julie Chouinard (Manager, ESRAB, HECSB, HC)
- Helen El-Koura (Senior Science Advisor, ESRAB, HECSB, HC)

Guest presenters (from Dow Chemical Company Ltd., United Kingdom):

- Dr. Christine Lukas – Dow Europe (United Kingdom)
- Mr. David Shortt – Dow Canada (Sarnia)
- Mr. John Davis – Dow USA (Midland Michigan)
- Mr. Nicholas Ball – Dow Europe (Horgen, Switzerland)

6a (ii). Information provided by the Government of Canada

Informed substitution (IS) is the considered transition from a chemical of particular concern to safer chemicals or non-chemical alternatives. The departments are exploring ways to advance the responsible replacement of chemicals of concern, and from a program design perspective, are looking to consider how applying an informed substitution lens could support chemicals management. IS may be encouraged and facilitated by a number of different policy means, including mandatory restrictions of certain substances in certain applications, development of tools for risk management and for the assessment of potential alternatives, and provision of support for research, development, and innovation.

The departments sought input from the committee on considering opportunities to support IS as part of core CMP activities (that is, information gathering, priority-setting, risk assessment, risk management, research and monitoring), exploring comparative chemical hazard evaluation tools, and building on CMP work and information to date.

Information on core CMP activities, data that have been collected throughout these activities and existing comparative chemical hazard evaluation tools were provided to the committee.

6a (iii). Information provided by the guest presenters

The Government of Canada invited Nicholas Ball (Product Sustainability Consultant, Dow Chemical), John Davis (Senior Environmental Scientist, Dow Chemical), Christine Lukas (Product Stewardship and Fire Safety Manager, Dow Building Solutions), and David Shortt (Dow Canada) to present: *Informed Substitution: A Practitioner's Perspective*. An example of the IS process undertaken by Dow Chemical was presented and discussed.

6a (iv). *Ad hoc* committee members' perspectives on the charge questions

The 3 *ad hoc* members, Joel Tickner (University of Massachusetts Lowell), David Widawsky (U.S. EPA), and Meredith Williams (California, EPA), gave short presentations on the topic of discussion.

Joel Tickner presented on advancing and mainstreaming green and sustainable chemistry and its relevance and timeliness to IS. He described the Green Chemistry and Commerce Council, its vision and mission and discussed the selection of targets for new collaborative and innovative projects. He concluded his presentation with lessons learned, which include the following:

- incumbent technologies are often difficult to substitute, and there is hesitation when alternatives may not function similarly or there are costs involved in the switch
- market pressure from key retailers and brands were noted to provide an important signal for innovation
- supply-chain dialogue and collaboration are critical to accelerating commercialization of green chemistry solutions

Meredith Williams delivered a presentation on California's *Safer Consumer Products (SCP) Regulations*. The presentation provided an overview of the SCP framework, which encompasses the candidate chemical list, priority products, alternatives analysis, and finally regulatory response. The two-stage alternatives analysis process and guidelines were reviewed. Examples of factors to be considered such as: adverse environmental impacts, adverse public health impacts, physical chemical hazards, physicochemical properties, associated exposure pathways, and life cycle segments were highlighted. The challenges to manufacturers were also discussed and include trade-offs to be considered, company's values and criteria, available information, data gaps, performance criteria, and any downside to the alternative.

David Widawsky delivered a presentation on informed chemical substitution from experiences at the U.S. EPA. The specific roles of chemicals in industry (for example, solvent, lubricant) and supply-chain requirements were contrasted with prevailing public policies to address chemical safety on a chemical-by-chemical basis rather than function or use. The complexities of employing and/or indexing suites of chemicals hazard endpoints, and both human health toxicity and environmental fate and effects were presented and reviewed. The U.S. EPA's Safer Chemical Ingredients List (SCIL) serves as a data-driven tool to identify safer chemicals based on such suites of chemical hazard endpoints, along with well-defined hazard endpoints. Where there are gaps in systematic hazard data for groups of chemicals of interest, new approach methodologies (NAMs) such as Quantitative Structure-Use Relationships (QSUR) models can be used to help predict both function and hazard for chemicals (or groups of chemicals) based on known hazard and functional use data for groups of chemicals with similar structures. The presentation concluded with a list of caveats for consideration.

6a (v). Committee input

The committee considered 3 charge questions: considering opportunities to support IS under the CMP, exploring comparative chemical hazard evaluation tools, and building on CMP work and information to date to support industry and other stakeholders in evaluating and selecting safer chemicals.

The committee briefly considered the main difference between IS and alternatives assessment (AA); however, it did not distinguish explicitly between the 2 terms in its deliberations, and thus most comments and responses may be general to both. In their deliberations, the committee noted that adopting an explicit IS approach in Canada will have new and unique challenges, as has been the case with adoption of IS frameworks by other jurisdictions. The committee believed the comments and suggestions in this report would, if addressed, accelerate formal activities to support the adoption in Canada. The committee also noted that developing an approach to support IS in Canada can be guided by considerable efforts undertaken within other jurisdictions.

As outlined in the committee's report, the committee identified a range of opportunities that the departments could explore to advance IS in Canada under the current chemicals management framework. The committee noted that the subject of AA and IS cannot be easily summarized into a "one-size-fits-all" approach. A case-by-case approach may be necessary, particularly in order to avoid decisions that are subsequently found to belong in the "regrettable substitution" group.

When deliberating on comparative chemical hazard evaluation tools, some committee members highlighted the need to also consider comparative exposure-oriented activities in parallel with the more traditional hazard-related options for AA/IS initiatives. The committee noted there are many methods and approaches available to conduct comparative hazard and exposure screening; it also cautioned against reinventing the wheel. Broad consensus was reached that a panel approach of key endpoints tailored to a functional use and exposure profile are preferred over an approach that aggregates information into a single overall score. While this charge question was focussed on comparative hazard evaluation tools, the committee noted that overall risk (that is, the inclusion of exposure considerations) is also a key consideration for a broader perspective to identify safer alternatives and support IS.

The committee agreed that making data collected, generated and analyzed throughout the CMP available to industry and other jurisdictions would support IS. It was recognized that these data could be used to contribute to existing tools, inform the development of new tools, and evaluate existing models to support IS.

The committee agreed that the subject of IS is complicated and may initially require a case-by-case approach to be taken. The committee strongly encouraged the departments to continue with their international engagement on chemicals management and to work with other jurisdictions to identify opportunities for data

sharing, create consistent databases, and work towards formalizing a generic IS paradigm.

For more information, view the January 2018 Combined Discussion Paper and Meeting Report

6a (vi). Use of committee input

As a method of knowledge transfer, a summary of the committee deliberations was presented to the following external and internal bodies:

- OECD *Ad hoc* group on substitution workshop (May 2018)
- CMP senior management meetings
- CMP Stakeholder Advisory Council

Dr. Joel Tickner at the Lowell Center for Sustainable Production at the University of Massachusetts Lowell developed a report under contract with ECCC entitled "Options for advancing Informed Substitution and Alternatives Assessment within Canada's Chemicals Management Program". This report was posted for public consultation from January – March 2019. The options presented in the report are consistent with those outlined in ECHA's 2017 Substitution Strategy, outcomes from the November 2017 CMP Stakeholder Advisory Council, the January 2018 CMP Science Committee, and recommendations from the June 2017 Standing Committee on Environment and Sustainable Development report (that is, CEPA review). Public comments received on the consultation paper, in addition to the committee's input, will be used to inform possible CMP modernization activities to support IS, a potential area of post-2020 focus.

It was noted that much of the input received from the committee supports what was also heard in other consultations including the CMP Stakeholder Advisory Council, and all summaries were therefore linked to the committee report for ease of reference. Of note, the approach proposed is for IS to be consistent with ECHA's 2017 Substitution Strategy.

6b. Topic: Advancing consideration of endocrine disrupting chemicals

July 18-19, 2018, Ottawa, Ontario.

6b (i). Attendees

Committee members:

- Dr. Jon Arnot
- Dr. Niladri Basu
- Dr. Richard Becker
- Dr. Weihsueh Chiu
- Dr. Miriam Diamond
- Dr. Michelle Embry
- Mr. Geoff Granville
- Dr. Elaine Cohen Hubal (by teleconference)
- Mr. Mike Rasenberg

***Ad Hoc* members:**

- Dr. Rebecca Clewell (Associate Director with ToxStrategies, North Carolina)
- Dr. Kevin Crofton (Consultant, R3Fellows, North Carolina)
- Dr. Markus Hecker (Professor and Canada Research Chair in Predictive Aquatic Ecotoxicology. Toxicology Centre, University of Saskatchewan)

Government of Canada officials:

- David Morin (Director General, SED, HECSB, HC)
- Christine Norman (Director, ESRAB, SED, HECSB, HC)
- Jacqueline Gonçalves [Director General, Science and Risk Assessment (SRA), Science and Technology Branch (STB), ECCC]
- Thomas Kruidenier (Acting Director, EAD, SRA, STB, ECCC)
- Dr. Tara Barton-Maclaren (Senior Manager, ESRAB, SED, HECSB, HC)
- Mark Bonnell (Senior Science Advisor, EAD, SRA, STB, ECCC)
- Maya Berci (Director, NSACB, SED, HECSB, HC)
- Dr. Mike Wade [Manager, EHSRB, ERHSD, HECSB, HC]
- Marisol Eggleton (Manager, EAD, SRA, STB, ECCC)
- Magdalena Jagla (Senior Science Advisor, EAD, SRA, STB, ECCC)
- Matthew Gagné (Senior Evaluator, ESRAB, SED, HECSB, HC)
- Jean Grundy (Senior Biologist Evaluator, NSACB, SED, HECSB, HC)
- Dr. Joanne Parrott [Research Scientist, Aquatic Contaminants Research Division (ACRD), Water Science and Technology (WST), STB]
- Dr. Robert Letcher (Research Scientist, EAD, EAD, SRA, STB, ECCC)
- Sarah Vanden Hoven (Science Advisor, ESRAB, HECSB, HC)

Secretariat:

- Julie Chouinard (Manager, ESRAB, HECSB, HC)
- Dr. Witnisse Mereus (Senior Policy Analyst, ESRAB, HECSB, HC)

6b (ii). Information provided by the Government of Canada

The departments were seeking input from the committee on scientific considerations related to how the Government of Canada could evolve the current approach for the identification and assessment of endocrine-disrupting chemicals (EDCs).

An EDC is an exogenous chemical that interacts or interferes with the function of the endocrine system. This may include the control of growth and maturation; reproduction and development, behavior and reaction to stimuli; the production, use, and storage of energy; and balance and maintenance of water and electrolytes in the body. As such, exposure to an EDC may change the production, transport, metabolism, receptor activation of downstream action of a hormone, resulting in disrupted messages received by a target tissue. Exposure to EDCs during critically susceptible periods of development (for example, development/differentiation of the brain, reproductive tract, reproductive organs) can result in adverse effects (that is, long-term and possibly multigenerational changes in function).

The goal of this meeting was to focus on the scientific considerations needed to guide the advancement of a potential program of work on EDCs in Canada that builds on international best practices and benefits from new and emerging methodologies and data. Towards this objective, the committee was asked to answer charge questions presented within the respective sections of this paper. Given that the departments carry out various activities related to chemicals management (that is, information gathering, priority-setting, risk assessment and risk management, research, monitoring and surveillance), the committee was generally requested to consider their input from a "fit-for-purpose" lens, identifying uncertainties as relevant to the decision context.

The assessment of EDCs presents potential challenges and uncertainties pertaining to sensitive developmental windows, multigenerational effects, non-monotonic dose response relationships, and low-dose effects. In many cases, a shift away from point estimates to probabilistic analyses could allow for richer characterization of individual risk, population incidence, and statistical confidence. Currently, existing test methods and guidelines (for example, U.S. EPA and OECD tests, OECD Conceptual Framework for Endocrine Disruptors) are suitable methods for evaluating EDCs in certain endocrine-related pathways, such as the Estrogen, Androgen, Thyroid, and Steroidogenic (EATS) pathway. However, in the future, medium-throughput assays (likely in combination with computational models) may be able to provide more confidence in identifying potential EDCs and predicting adverse effects, thus allowing for EDC identification in the absence of *in vivo* tests and/or to focus *in vivo* testing for adverse effects (human health or ecological).

Individual test guidelines can have limitations, and often, the identification of an EDC or potential EDC may require a complement of these available tests (or supplementation by appropriate NAMs to identify a potential endocrine mode of action and related apical adverse effects. A weight-of-evidence evaluation across multiple studies and multiple levels is often required for evaluating the results of these test methods and integrating various streams of information to determine targeted necessary next steps (OECD Conceptual Framework and Guidance Document 150).

It was noted that non-EATS mediated modes of action for endocrine disrupting action is a growing area of research; assay development continues.

6b (iii). *Ad hoc* and core committee members' perspectives on the charge questions

The 3 *ad hoc* members, Rebecca Clewell (ToxStrategies North Carolina), Kevin Crofton (R3Fellows, North Carolina), and Markus Hecker (University of Saskatchewan, Saskatoon), gave short presentations on their perspective on EDCs and the charge questions.

Rebecca Clewell presented case studies towards developing a tiered approach to the evaluation of endocrine disrupting compounds. Central to this presentation was the use of *in vitro* toxicity data to support chemical risk assessments. The tiered approach ultimately leads to what was described as "fit-for purpose" risk assessments. Adverse Outcome Pathway (AOP)-based assay development was recognized as comprising Tier 1. Tier 2 testing *in vitro* was also discussed using high-throughput screening (HTS) assays. The presentation concluded that the complexity of the *in vitro* system used depends on the purpose. Specifically, that high throughput assays support prioritization by combining exposure modelling and bioactivity data, while more organotypic assays may support Point-of-Departure (PoD) value determination. AOP-driven assay development supports robust biological readout. Well-designed *in vitro* assays can provide reasonable predictions of human response.

Kevin Crofton presented considerations for matching hazard data uncertainties to regulatory needs. Central to this presentation was the discussion of benefits and challenges in adopting different methodologies to inform risk assessments of endocrine disrupting compounds. He also suggested that the development of case studies using diverse data sets with ranges of uncertainty could highlight current usefulness and residual uncertainty of data, and that these uncertainties could drive data needs for research, risk assessment and risk management moving forward. It was highlighted that the real proof of reliability is in the replication of effects and in judging the uncertainty in data.

Markus Hecker presented on endocrine disruption from a chemical and ecological risk assessment perspective. The presentation began with a review of the impacts of endocrine-disrupting chemicals on wildlife and human health. Next-generation risk assessment approaches for environmental contaminants and the development of alternative testing strategies to animal testing for chemical prioritization and ecological risk assessment were also discussed. Dr. Hecker highlighted that mixed messages in regulation/decision making among jurisdictions can be problematic and may lead to confusion. When communicating risk, scientists may disagree on certain approaches or interpretation of data; however, they speak the same language and can communicate efficiently among each other. However, what is needed is for scientists to improve the communication of results and risks with the public and decision makers who may not have a scientific background.

Two core members also provided short presentations.

Core member Richard Becker presented a review of relevant frameworks for organizing and integrating knowledge of bioactivity, toxicity, and exposure and suggested that they be considered as members evaluate and discuss Charge Questions.

Weihsueh Chiu's presentation was entitled: Endocrine Disruptors: Lessons Learned from the U.S. National Academies' Report *Application of Systematic Review Methods in an Overall Strategy for Evaluating Low-Dose Toxicity from Endocrine Active Chemicals*.

6b (iv). Committee input

Some members of the committee considered that the identification, assessment, and management of EDCs can be adequately conducted according to current and evolving science-based processes. Other members considered that EDCs could be unique and therefore concluded that additional policy-based responses may be appropriate. The committee did not further address these differing perspectives.

The committee responded to all 3 charge questions. Highlights comprise the following:

- The committee offered a workflow consisting of a tiered testing and evaluation framework, starting with non-test methods (for example, *in silico* and predictive models), and then including high-throughput *in vitro* testing, medium-throughput assays (which include greater complexity), and ending with *in vivo* testing if warranted. This workflow aligns with the risk characterizations for non-EDC pathways, but the discussions focused on EDC-specific pathways.

- The greatest certainty lies with characterizing EATS pathways through high- and medium-throughput assays. However, non-EATS pathway assays (such as for developmental neurotoxicity and obesity) require additional development.
- Issues that arose but were not, or only partially, resolved included: (1) adequately capturing population variability (including vulnerable populations and life stages), (2) performing cross-species extrapolation, and (3) assessing cumulative risk from exposures to chemical mixtures and non-chemical stressors.
- In addition, the committee noted the need to better consider the full range of chemicals, metabolites, and degradation products of parent compounds using QSAR and other NAM as available and relevant.
- The committee discussed using the AOP framework to organize future work (as a paradigm to translate between molecular initiating events and key events), which can inform assessment endpoints from high-throughput or medium-throughput assays, and help to provide context related to apical endpoints as well as inform data needs and methods development.
- In discussing the Threshold of Toxicological Concern (TTC) approach for human risk assessment, the committee suggested developing an EDC-TTC for both human and ecological health.
- Improvements to exposure assessment should be considered (such as greater reliance on biomonitoring and environmental effects monitoring).
- The committee also made 6 major recommendations: conducting a strengths, weaknesses, opportunities, and threats (SWOT) analysis; conducting case studies to glean "lessons learned"; convening expert panels to advance EDC-related risk assessment activities; fostering improved data sharing; and stepping towards "big and bold" thinking to address the challenges with respect to EDCs from a multidisciplinary perspective.

For more information, view the July 2018 committee report.

6b (v). Use of committee input

Members of the committee proposed "NAM-based conceptual strategy" were used to inform the development of post-2020 science proposals, which are now being actively worked on by the departments. For example, clustering of Domestic Substance List (DSL) substances based on endocrine activity (including model development), and investigating specialized *in vitro* assays suitable for a dose-response assessment of potential endocrine disrupting substances were presented at the committee's NAM-based conceptual strategy and post-2020 science proposals at an internal technical workshop.

Concepts outlined in Figure 1 of the committee's report have already been integrated into version 2.0 of the Ecological Risk Classification (ERC) approach by ECCC.

The committee proposed the need for case studies to evaluate the ability of lower-tiered (*in silico* and *in vitro*) approaches to appropriately identify EDCs using computational approaches. Examples of case studies include a bisphenol case study using mammary epithelial cells and gene expression changes, and ERC2 for ecological prioritization.

In addition, the committee identified the zebrafish assay as a promising area for further research. It has been suggested that through the CMP, the departments should promote the development of the zebrafish assay by convening a group of experts that are studying zebrafish in Canada.

6c. Topic: Public health approach to chemicals management in Canada

November 28–29, 2018

6c (i). Attendees

Committee members:

- Dr. Jon Arnot
- Dr. Niladri Basu
- Dr. Elaine Cohen Hubal
- Dr. Miriam Diamond
- Dr. Michelle Embry
- Mr. Geoff Granville
- Mr. Mike Rasenberg

Regrets:

- Dr. Richard Becker
- Dr. Weihsueh Chiu

***Ad hoc* members:**

- Dr. John McLaughlin (Chief Science Officer and Senior Scientist, Public Health Ontario and Professor, Dalla Lana School of Public Health, University of Toronto, Ontario)

- Dr. Leonardo Trasande (Vice Chair for Research and Director, New York University Lagone Health, New York)

Government of Canada officials:

- David Morin (Director General, SED, HECSB, HC)
- Tim Singer (Director General, ERHSD, HECSB, HC) (Day 1)
- Nicole Davidson (Director, EAD, SRA, STB, ECCC) (Day 1)
- Christine Norman (Director, ESRAB, SED, HECSB, HC)
- Patricia Pelletier (Director, EHSRB, ERHSD, HECSB, HC)
- Dr. Tara Barton-Maclaren (Senior Manager, ESRAB, SED, HECSB, HC)
- Yemi Agboola [Division Manager, Population Studies Division (PSD), EHSRB, ERHSD, HECSB, HC]
- Louise Hayes (Manager, Chemicals and Environmental Health Management Bureau (CEHMB), SED, HECSB, HC] (Day 2)
- Graham Howell [Senior Advisor/Policy Development Manager, Director General's Office (DGO), Policy, Planning and Integration Directorate (PPID), HECSB, HC]
- Kathy Hughes (Manager, ESRAB, SED, HECSB, HC)
- Muna Idris (Program Coordination Manager, CEHMB, SED, HECSB, HC) (Day 1)
- Daren Kelland (Manager, RMB, SED, HECSB, HC)
- Ellen Lye (Toxicologist, EHSRB, ERHSD, HECSB, HC)
- Arezoo Matin (Policy Analyst, ESRAB, SED, HECSB, HC) (Day 1)

Secretariat

- Julie Chouinard (Manager, ESRAB, SED, HECSB, HC)
- Christine MacKinnon-Roy (A/Science Advisor, ESRAB, SED, HECSB, HC)

Guest Presenter

- Kathleen Deener (Office of Research and Development, U.S. EPA, Washington, DC)

6c (ii). Information provided by the Government of Canada

The departments are exploring the potential development of a roadmap for how to address chemical risks with a public health (or population health) approach in Canada. Such an approach could support the government's post-2020 program for chemicals management.

This meeting focused on what foundational elements would be required to develop a roadmap to advance a public health approach to chemicals management in Canada. It is understood that such an approach would take significant resources and time to move

forwards, so the goal of the meeting was to identify the first steps to move towards such a goal.

With advances in science, together with outcomes and learnings of the CMP, a public health-based approach to chemicals management is becoming increasingly important. A public health approach would attempt to tie increased risk of specific diseases or outcomes to chemical management actions (for example, research, monitoring and surveillance, priority setting, risk assessments, risk management). This approach would build on the traditional risk-based approach and be complementary.

A public health approach to chemicals management would start with building the required knowledge base regarding which human health diseases we know or expect are associated with exposures to chemicals. The public health approach would then screen known chemicals (for example, via biomonitoring and epidemiological studies) to determine which ones might be the greatest contributors to those diseases. It would either identify priorities for traditional assessments and risk management actions, if needed, to reduce those contributors to those diseases, or provide adequate evidence to support prevention strategies without a traditional assessment. In many cases, a shift away from point estimates to probabilistic analyses will enable a richer characterization of individual risk, population incidence, and statistical confidence.

A public health approach to chemicals management in Canada would allow the Government of Canada to focus efforts as required on priority areas post-2020 such as vulnerable populations and cumulative risk as suggested in the "Follow-up Report to the Standing Committee on Environment and Sustainable Development on the *Canadian Environmental Protection Act*." Regarding vulnerable populations, the Lancet Commission highlights that

> "*in countries at every income level, disease caused by pollution is most prevalent among minorities and the marginalised. Children are at high risk of pollution related disease and even extremely low-dose exposures to pollutants during windows of vulnerability in utero and in early infancy can result in disease, disability, and death in childhood and across their lifespan*."

Accurately estimating chemical exposure and toxicity information are required in order to determine the impact of chemicals on human health. Exposure science fundamentally informs decisions that relate to smart and sustainable design, prevention, and mitigation of adverse exposures, and ultimately, health protection.

To address this, a public health approach could generate data and epidemiological studies that could characterize the multitude of chemical exposures across populations and time. This would involve developing and implementing better tools (for example, new study designs and statistical methods) to generate complex information on multiple exposure-response relationships encompassing disease incidence, progression, and mortality (rather than a single health endpoint).

Although the roadmap should encompass a long-term timeline (that is, 20+ years), the activities described should be those that could be carried out in the short- and medium-term (that is, 5–10 years) and which could provide the evidence to determine whether such an approach would be useful and achievable for a post-2020 chemicals management program.

6c (iii) Information provided by the guest presenter

The Government of Canada invited Kathleen Deener from the U.S. EPA's Office of Research and Development to present at this committee meeting.

Kathleen Deener provided an overview of risk assessment challenges and opportunities using a public health approach, and presented the public health approach as a mechanism to problem solving. An example using clean air and cardiovascular disease was provided. The presentation concluded by summarizing key points including that a public health perspective can complement traditional risk assessment approaches, and that it is important to consider all data streams. Finally, the need for partnerships was emphasized.

6c (iv). *Ad hoc* and core committee members' perspectives on the charge questions

The Government of Canada invited 2 *ad hoc* members to participate at this committee meeting: John McLaughlin (Public Health Ontario and University of Toronto, Ontario) and Leonardo Trasande (New York University, New York). Two core members, Elaine Cohen Hubal and Niladri Basu, gave short presentations on their perspective on a public health approach to chemicals management and the Charge Questions.

John McLaughlin reviewed different public health approaches, provided examples and considered their impacts. A conceptual model of exposomics, genomics, and health across the life course was discussed. The ability to link health records across platforms was highlighted as a distinct Canadian advantage. Other advantages include already established cohort studies of large populations. There is a unique capacity to link data systems, including environmental, occupational, socio-demographic and health systems,

and that institutions across Canada have invested in infrastructure and capacity that can be applied to support initiatives that protect health and prevent disease. A public health approach can deliver diverse impacts; for example, detecting at-risk populations, monitoring exposures, fostering discovery, managing interventions, managing risks, and providing evidence to guide priority setting. Platforms for discovering, monitoring, and characterizing chemical effects can be informed by public health surveillance systems, and the application to detect and respond to disease risks.

Leonardo Trasande from New York University, School of Medicine, presented on harmonizing the burden of disease estimation due to environmental chemicals. It was emphasized that estimating the burden of disease is extremely important to policy-making. Current environmental burden of disease approaches were described as being "disharmonized" and, as a result, there is a need to embrace concepts such as "probability of causation" as well as subclinical effects. Data availability was identified as a gap, particularly as it relates to the availability of biomonitoring data. It was highlighted that biomonitoring programs therefore need to be more coordinated.

Elaine Cohen Hubal provided a brief overview of the U.S. EPA's Children's Environmental Health Research Roadmap and concluded with methods (from exposure and discovery science) to elucidate contributions of modifiable exogenous environmental factors to health outcomes**.**

Niladri Basu presented on the 2017 Lancet Commission on Pollution and Health Report with a public health approach lens.

6c (v). Committee input

Overall, as outlined in the committee's report, the committee provided detailed comments on potential opportunities and challenges for the development of a public health approach, on potential data gaps and available tools, and key elements that should be considered as part of a roadmap in the short-to-medium term development of the approach.

The committee identified key elements that should be considered when developing a public health approach in the short to medium term. They discussed the concept of "One Health" which is a concept that incorporates both human and eco-burdens of health.
Some examples for types of activities included: developing new partnerships to leverage data sources, adopting new technologies and approaches and, integrating environmental monitoring into the approach.

The committee suggested moving to a more holistic approach based on multiple determinants of health, where one or more of those determinants is chemical exposure. They identified the public health approach as an opportunity to work with other groups and jurisdictions to leverage expertise and to assess the economic costs of inaction. The committee also highlighted that there may be challenges in coordinating work across multiple groups, finding appropriate long-term cohort studies, and communicating issues to a broader audience.

When asked about data and tools that were required to develop a public health approach, the committee highlighted the need to first identify data gaps. They also suggested focussing on smaller subgroups (for example, vulnerable populations), engaging existing cohorts, and considering different methodologies to answer different population health questions (for example, non-targeted testing versus geospatial analyses), as well as investigating "known knowns", which are linkages between a toxic chemical and adverse health effects. The committee also discussed the types of case studies that could be followed; for example, a study that is smaller-scale yet data rich would be beneficial to use as a proof-of-concept in order to move the public health approach forward.

For more information, view the November 2018 committee report.

6c (v). Use of committee input

The committee's report has been extensively shared internally in both departments.

As per the committee's recommendation, the departments agreed that the public health approach should be considered more broadly in order to include ecological concerns. Consequently, it was renamed as the "Ecological Public Health Approach." In order to broaden the approach, a working group of researchers from ECCC was convened in the summer of 2019 to develop a concept paper outlining ecological considerations.

The ecological public health approach has also been highlighted as a topic of interest outside of the CMP. In December 2018, the HC Deputy Minister had an opportunity to discuss environmental health with the Chief Science Advisor, and it was agreed that more discussions were needed in order to explore the topic. A senior-level interdepartmental working group has been formed to discuss how to address environmental health issues, including chemical exposures. The working group is chaired by the Environmental and Radiation Health Sciences Directorate in HC and includes representatives from ECCC, Statistics Canada, the Public Health Agency of Canada, Indigenous Services Canada, and the Canadian Institutes of Health Research. A

workshop was held in November 2019, to discuss overcoming institutional barriers and integrating their respective resources.

Recently, a new Office of Environmental Health has been established at Health Canada to advance a scientific framework on environmental health. The office will enhance capacity for interdisciplinary research by identifying opportunities to integrate existing sources of public health, clinical and disease surveillance data.

The Committee input has provided officials with considerations moving forward.

7. Next steps

7a. Review

The committee adheres to the Health Canada Policy on External Advisory Bodies, and the policy recommends that periodic reviews of external advisory bodies be conducted. In addition, the terms of reference for the committee specify that a review is to be conducted every 3 years. The next review is starting in July 2020.

The review will focus on the ongoing relevance of the committee's mandate, the effectiveness and efficiency of the committee, and whether or not any administrative, management or other improvements are required by the committee, the Government of Canada, and/or the secretariat.

8. Resources

8a. Website

CMP Science Committee information is available in the CMP Science Committee section of the website. This section provides access to information on the core members, meeting records, committee reports, and the terms of reference.

When new information about the committee is posted, subscribers will receive an email with details about the new content. To subscribe to receive these email notifications about the CMP, including the CMP Science Committee. Any new committee postings are also noted in the "Latest News".

8b. Additional information

CMP Science Committee member information

CMP Science Committee meeting records and committee reports

CMP Science Committee terms of reference

Health Canada Policy on External Advisory Bodies

CMP Challenge Advisory Panel

CMP Stakeholder Advisory Council

For more information on the CMP Science Committee, please contact the secretariat by e-mail at hc.cmp.science-pgpc.sc@canada.ca