Chemical Hazard Data Commons Working Paper[1]

Facilitating Decision Making with Assessment Summaries

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Some of the users of the Data Commons identified in this white paper are consumers and/or creators of highly detailed information about chemicals and their hazards. For many others, however, detail about scientific studies and chemical structures are not useful. Product designers looking for better ingredients, architects looking to improve the health of the spaces they design, workers seeking to understand hazards in their workplace, and policy makers creating regulations to guide industrial development are just a few examples of users who seek summary indicators to help them understand this chemical hazard data. They do not necessarily have interest in, or even have the skills or time to interpret, detailed hazard studies about a chemical. They do, however, have a strong need for reliable summary metrics and benchmarks on chemical hazards to help them compare and prioritize chemicals. They may need the information at the level of a health endpoint ("avoid all substances that are carcinogens"), or at an even higher summary level ("use only substances with a Benchmark 2[2] or higher"). They may also seek summary information about the life cycle of chemicals, interpretation of emerging science, or a high level view of the actions of other policy makers.

This section describes three types of hazard information that in summary form can be useful to decision-makers, whether for corporate or public policy.

1. **Direct Hazard** information encompasses hazard assessments related to direct exposure to a substance or group of related substances. Very few chemicals have been assessed for their hazard in a consistent and accessible way to support decision-making. Hazard information should include data gaps and information about hazards generally associated with groups (such as fluorinates, ketones, etc.) to which the chemical belongs. The Data Commons can incentivize the generation of consistent summary information about direct chemical hazard, and support widespread access to these assessments for decision-making and policy guidance.
2. **Life Cycle** information encompasses impacts that may occur anywhere in the life cycle of the substance from extraction and manufacture to disposal. This type of information is even more difficult to obtain then use phase hazards.
3. **Policy** information provides indicators of public and private efforts to research, manage, or restrict the use of chemicals of concern.

The Data Commons can integrate access to all three types of information, provide benchmark indicators, facilitate development of overall summaries to help decision-makers in purchasing, design, or policy-find their way through the data jungle.

1. Direct Hazard Information

Summary direct chemical hazard information can be divided into two types representing two levels of analysis that are commonly practiced in chemical hazard assessment:
1) *List Screening* against authoritative hazard lists and

[1] See Lent, Tom, et al, *Toward Safer Products: Accelerating Change with a Chemical Hazard Data Commons* for an overview of the Chemical Hazard Data Commons project at https://commons.healthymaterials.net
[2] A Benchmark is a rating in the Green Screen for Safer Chemicals www.greenscreenchemicals.org

2) *Full Assessment* of the scientific literature[3]

In **List Screening,** a substance is compared to preset lists of substances. Lists reviewed may include both restricted substance lists and authoritative and screening lists associating substances with specific human and environmental health endpoints or environmental fates. There are three levels of analysis that may be done with list screening:

- Pass/fail screening of ingredients against a restricted substance list (a "red list"),
- Identification of hazards underlying listings on specified hazard lists, and
- Benchmarking of levels of concern from listings on specified hazard lists, either by endpoint or overall for the chemical.

List screening is very useful for the rapid screening of large numbers of chemicals, With the emergence of automated tools, (see below) it can be done without the time and expertise required to do a full toxicological assessment. It is limited, however, to identifying known and suspected high hazard chemicals and cannot be used to identify inherently safer chemicals. Authoritative hazard lists are only available for a limited number of chemical - endpoint combinations. M**any chemicals have been studied and revealed to have high hazards but have not yet been listed on authoritative hazard lists**. . Affirmatively identifying if a given chemical is preferable to a known high hazard chemical requires a full assessment of the chemical across all endpoints. Otherwise there is a significant risk of making a regrettable substitution with a chemical of equal or higher hazard.

In **Full Assessment**, substances are individually researched to provide more information about health hazards than the screening lists alone provide. A full assessment will start with research of the scientific literature and then use modeling tools and analogues in an attempt to assess all relevant health endpoints and environmental toxicity and fate issues. A robust protocol will limit the number and type of allowable data gaps for the assessment to be considered complete. Full assessments often conclude with rolling up the research through a defined protocol into a summary benchmark or score that can be used to compare the hazard level or preferability of different substances.

List screening is very useful for the process of determining which chemicals in a product or process to prioritize for replacement. The alternatives assessment process, however, requires a deeper dive and should be a part of any strategy for moving production to inherently safer materials. Finding alternatives to the chemicals prioritized by a list screening exercise should be informed by a full assessment to avoid "regrettable substitutions" with chemicals that are not yet listed on authoritative hazard lists, but which are equally hazardous or may have other unlisted hazard trade-offs.

A number of protocols have been developed to guide the assessment of chemical hazard and provide summary measures that can be reported and used for comparison between chemicals. Many third party assessment organizations have developed proprietary systems to help their customers evaluate chemicals for regulatory compliance, understand hazard profiles and assess alternatives. Examples of these are Pharos Chemical and Material Library, the SciVera Lens[4], GreenWERCS Formulation Profiling Tool,[5] and Chemical Compliance Systems Chemical Ratings[6] GreenScreen List Translator. These tools have facilitated some significant assessment efforts in targeted industries. Likewise, the Cradle to Cradle Product Innovation Institute's (C2CPII) Cradle to Cradle Certified program[7] has sparked health

[3] For a more detailed description of list screening and full assessment than provided here, see the USGBC report "Material Health Evaluation Programs - Harmonization Opportunities" http://www.usgbc.org/resources/material-health-evaluation-programs-harmonization-opportunities

[4] www.scivera.com

[5] www.thewercs.com

[6] www.chemply.com

[7] http://www.c2ccertified.org

assessment of materials in the building industry and elsewhere.

Open Standard Assessment Protocols can provide Assessment Guidance

Accelerated action to change industrial practice requires the consistent market signaling and affordable access to results that only an open, non-proprietary protocol can afford. The US Environmental Protection Agency's Design for the Environment Program (DfE) has developed Alternatives Assessment Criteria for Hazard Evaluation[8] as a transparent tool for evaluating and differentiating among chemicals based on their human health and environmental hazards. It establishes criteria that define "High," "Moderate," and "Low" concern levels for a set of 14 human and environmental health endpoints.[9] There are some drawbacks to the DfE tool. It does not work for identifying and comparing non-chemical, design alternatives. For example, the DfE assessment of flame retardants only identified chemical flame retardant alternatives and did not compare structural design alternatives such as the use of barrier fabrics. Secondly, "data poor chemicals," whether actually safer or not, tend to look better in comparison to well characterized, "data rich chemicals." It is well aligned with the United Nations Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[10], with modifications to better differentiate among chemicals. DfE uses this tool for its own assessments and freely offers the protocol for others to use.

Many users need an additional level of summary of this kind of multi-endpoint analysis to support consistent and efficient decision making. In benchmarking, a procedure is established for weighting different hazard endpoints to evaluate tradeoffs and provide one or more levels of overall concern. This provides a standardized way of summarizing the full assessment facilitates the screening of chemicals of the highest concern, and simplifies comparison of the relative preferability of alternatives. Clean Production Action (CPA) has developed the GreenScreen for Safer Chemicals,[11] a free and publicly available protocol that builds on the DfE protocol with more endpoints,[12] and a procedure for benchmarking chemicals on a 1-4 point scale using the results of the hazard level setting process.

The GreenScreen for Safer Chemicals® is being used by a number of companies in different industries around the world for internal decision-making (for example HP, DSM, Nike, and Staples), and as a policy tool by a wide variety of government agencies and industry collaboratives, such as the State of Washington, the Green Chemistry & Commerce Council (GC3), Zero Discharge of Hazardous Chemicals (ZDHC),[13], PINFA,[14] and BizNGO[15].

The GreenScreen® also provides a framework for a number of product content disclosure tools, such as HBN's Pharos Project Building Product Library[16] and the Health Product Declaration (HPD).[17]

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[8] www.epa.gov/dfe/alternative_assessments.html

[9] Acute toxicity, Carcinogenicity, Mutagenicity/Genetic toxicity, Reproductive toxicity, Developmental toxicity, Neurological toxicity, Repeated dose toxicity, Respiratory & Skin sensitization, Eye irritation, Dermal irritation, Acute & Chronic Aquatic toxicity, Persistence and Bioaccumulation/ Bioconcentration

[10] http://www.unece.org/trans/danger/publi/ghs/ghs_welcome_e.htm

[11] www.greenscreenchemicals.org

[12] Endocrine Activity, Flammability and Reactivity

[13] http://www.roadmaptozero.com/

[14] PINFA is the Phosphorus, Inorganic and Nitrogen Flame Retardants Association and is a Sector Group within Cefic, the European Chemical Industry Council http://www.pinfa.eu/

[15] Business-NGO Working Group for Safer Chemicals and Sustainable Materials http://www.bizngo.org Their Plastics Scorecard using GreenScreen is in development with a first draft scheduled for release in April 2014.

[16] http://pharosproject.net/

[17] http://hpdcollaborative.org/

GreenBlue's Material IQ (MIQ),[18] a proposed database of manufacturing materials profiled according to their level of inherent chemical hazard, has demonstrated use of the GreenScreen as the standardized hazard protocol for its system.

Cradle to Cradle Certification uses a similar chemical hazard assessment structure.[19] C2C is in discussions with CPA to further harmonize their hazard assessment protocols, given that substantial overlap between the two protocols already exists.[20] However, while the hazard assessment protocol is very similar to the Green Screen, the full Cradle to Cradle Certified material assessment methodology also includes product and use specific exposure considerations and is more challenging to automate at scale. Nevertheless, the broader availability of standardized hazards assessment results would directly support future Cradle to Cradle Certified material assessments and certifications.

The US Green Building Council (USGBC) LEED green building rating system[21] uses the GreenScreen List Translator and GreenScreen Full Assessments as well as Cradle to Cradle certifications. Its new Material Ingredients credit released in 2013[22] provides credit for use of building products that avoid Benchmark 1 chemicals as defined by the List Translator. It then provides higher rewards for those that confirm with a Full Assessment that the product only contains Benchmark 2 or higher chemicals.[23]

The GreenScreen® is rapidly emerging as a leading standard protocol for organizations seeking to inform alternative material selection and product design with chemical hazard assessment. Significant obstacles to taking it to scale and to more global use, however, include the difficulty of list screening and the cost and availability of fully validated GreenScreen® assessments.

Facilitating Access to List Screening

As defined in the GreenScreen® List Translator, list screening can be a very tedious, resource intensive process. It currently requires searching for each chemical on 36 different authoritative lists with hundreds of sublists, housed by different organizations around the world in widely varying formats often on web sites with no easy search functions.

This challenge has already been addressed by several chemical information providers who have both developed databases that aggregate the authoritative lists referenced by the List Translator (and some additional lists), and make them available with search tools that make a user's list screening process easy and fast. The Wercs provides this search as part of its GreenWERCS Profiling Tool. HBN's Pharos Project provides this search function to Pharos subscribers in its Chemical and Material Library.[24] HBN also offers licensed API[25] functionality to support other systems in incorporating List Translator results in their applications, such as the HPD Builder.[26] This is helping make GreenScreen Benchmark summary

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[18] www.materialiq.com/ A slide show from the SPC Spring Meeting San Francisco, CA March 21, 2013 describing MIQ and its use of GreenScreen is here

[19] www.c2ccertified.org/product_certification/c2ccertified_product_standard

[20] Material Health Evaluation Programs Harmonization Opportunities http://www.usgbc.org/resources/material-health-evaluation-programs-harmonization-opportunities

[21] US Green Building Council (USGBC Leadership in Energy & Environmental Design (LEED) www.usgbc.org/leed a third party verified program for rating the environmental and health attributes of a building.

[22] LEED BD+C: New Construction v4, Building product disclosure and optimization - material ingredients www.usgbc.org/node/2616399

[23] See www.greenscreenchemicals.org/practice/greenscreen-users for more on users of the GreenScreen.

[24] http://pharosproject.net/material

[25] API – Application Programming Interface – allows interaction of multiple computer systems. In this case it allows another computer application to make use of some of the data in the Pharos Chemical and Material Library

[26] http://tool.hpdcollaborative.org/user/auth/register/enter/builder

information more widely and affordably available, and encouraging the development of GreenScreen as a common language of chemical hazard.

> ** *Data Commons Recommendation:* Develop a shared vocabulary for describing endpoint-specific and chemical-level hazard summary information (e.g., GreenScreen® "hazard levels" and GreenScreen® benchmark results), to facilitate consistent data exchange and assessment of chemicals. Maximize concordance with the GHS to keep it globally useful. Leverage the HBN API functionality to use the GreenScreen List Translator in other screening applications, so as to encourage ready access to GreenScreen hazard levels and Benchmarks, and to encourage their development as a common language of summary-level chemical hazard information.

The authoritative hazard lists that make up these systems are constantly changing. Agencies update their lists at wildly varying frequencies – from every few months to only every few years – and on varying schedules. Agencies do not consistently publish alerts when they have made changes, or when they do make changes, which items have changed. The format in which the lists are published is very disparate and in many cases very difficult to access. Identification of chemicals and classes of chemicals is not consistent from one agency to another. Hazards are identified by differing methods. The process of keeping up to date with the changes to the lists manually is hence expensive and error prone.

> ** *Data Commons Recommendation:* Develop and circulate standards for publishing accessible authoritative hazard lists and encourage agencies to use these consistent standards. Encourage agencies to publish data with API access, to allow automated retrieval and direct -computer-to--computer communication of changes.

> ** *Data Commons Recommendation:* Develop scraping tools that assist with automated retrieval of data from non API-compatible authoritative hazard agency websites and automated tools to facilitate clean-up and comparison of new data.

Obstacles to Widespread Access to Full Assessments

As noted above, list screening is useful for rapid assessment to identify substances that should be prioritized for replacement due to their presence on authoritative hazard lists. It does not, however, provide assurance that an unlisted chemical is actually safer. This requires a full assessment of the alternative substances. This step is limited by the lack of ready public access to information about large numbers of fully assessed chemicals.

GreenScreen® chemical hazard assessments that have been verified are beginning to become available. Public verified GreenScreen® assessments are now published by HBN in its Pharos Chemical and Material Library,[27] by The Interstate Chemicals Clearinghouse (IC2) in their Chemical Hazard Assessment Database,[28] and by Clean Production Action in their GreenScreen Store.[29] Thompson Reuter's TechStreet sells non-public GreenScreen® assessments for a fee[30] as does the CPA GreenScreen Store. To date, however, only a small number of GreenScreen ®Full Assessments have been openly published.[31] Growth of publicly funded GreenScreen® assessments is expected to remain very slow given the lack of funding necessary to assess thousands of chemicals a year, or the regulatory requirement that chemical producers do so. Hundreds of non-verified GreenScreen® assessments have

[27] www.pharosproject.net/material

[28] www.newmoa.org/prevention/ic2/projects/resource/hazassesstool.cfm

[29] http://www.greenscreenchemicals.org/gs-assessments

[30] (www.techstreet.com and search for the term "GreenScreen"

[31] As of January 2014 only 17 assessments are published on the IC2 database

already been completed privately by Profilers[32] and the industry could potentially produce thousands per year. These privately funded assessments, however, are rarely published. To bridge the difference between the real cost of doing assessments and what they feel they can charge to interested companies, GreenScreen® Profilers do not release the assessments into the public domain, but rather hold copyright to them in the hopes of reselling the assessments to other interested parties to recoup costs and profit. This resale market is in turn constrained by lack of potential buyer knowledge that profilers exists or that Profilers GreenScreen® are available.

Developing a Chemical Hazard Assessment Exchange to Accelerate Assessment

The Data Commons can help resolve these challenges. Two approaches can help lower the cost to users of obtaining assessments and accelerate their use in industry: 1) lower the cost of doing assessments, and 2) amortize the cost of assessments across more users. The Data Commons can address both. A chemical hazard assessment exchange could offer open access to verified public GreenScreen® assessments and paid access to privately funded verified GreenScreen® assessments that are available for license. By amortizing the cost of assessments across many users, this Exchange could dramatically reduce the cost of assessments to each user and help accelerate their use. Section 3 of this paper discusses Data Commons functions that can help reduce the cost to the assessor of producing an assessment.

The Exchange also could offer access to other types of chemical hazard assessments both public, such as DfE assessments, and private for license, such as C2C assessments. The DfE and C2C assessments summarize the endpoints with a hazard level for each, just as the GreenScreen® does. The GreenScreen®, C2C and DfE protocols have substantial parallels in their protocols but there are differences to resolve. While the endpoints overlap considerably they divide the data differently in some cases. Thresholds for setting hazard levels are not yet standardized, and also differ in how endpoint-specific evaluations are combined into an overall hazard level for the substance. DfE does not set an overall chemical rating (i.e., benchmark). C2C assessments overlay a product specific risk assessment to incorporate exposure issues before setting a rating for the chemical, as well as incorporates a cyclability score to the roll-up. These differences between the systems would have to be addressed to co-populate them in a common database. Discussions are already in progress to more closely harmonize these systems. There is sufficient overlap between the systems now, however, to provide potential value in including them all in an Exchange even without complete harmonization.

> ***Data Commons recommendation*: Continue harmonization discussions among the systems. Investigate ways to maximize commonality and incorporate all of them in the shared data planning.

Providing One-Stop Access to Assessments

A single portal could provide one-stop access to listings of chemicals with any kind of assessment and links to purchase a license to use a verified GreenScreen® assessment for a public claim. All assessments completed for governmental agencies or under other conditions that pay for public release would be freely available. under the terms of the copyright restriction. Profilers would also be encouraged to place their GreenScreen® assessments that result in a Benchmark 1 (the worst category) in open access and, only license assessments resulting in a higher Benchmark and therefore have value to manufacturers seeking to improve from Benchmark 1 ingredients.

Kickstarting the Exchange

exchange could function bi-directionally, supporting license sales of previously produced assessments, and providing a way for manufacturers or others to signal to profilers their interest in an unassessed

[32] "Profiler" is the term for a third party chemical assessment firm that has been trained in the use of the GreenScreen® protocol and licensed by CPA

chemical.

A two-tier Kickstarter type model[33] could provide flexibility and facilitate use of crowdfunding and market forces to incentivize rapid development and usage of assessments while providing a pathway to move widely used assessments into open public access. The first tier would be a threshold for the total commitments needed before a Profiler would commit to carry out the assessment. Minimum commitments for a license to use the assessment could be determined by an algorithm from inventory data on intensity of use of the chemical and activity in the product category. Any entity could, however, put any amount in at any time to move the cause and get a stake in the chemical's assessment, including committing the full amount to initiate the assessment immediately.

The Profiler would be selected to receive the assignment from a standing rotation of pre-qualified Profilers. Once the assessment is completed, any entity paying the minimum fee would be licensed to use the assessment for public claims about the chemical. Once the second tier higher threshold is met, the assessment would be placed in open access and be freely available to all participants in the system under the terms of the copyright restriction until the three-year expiration. .

At the three-year expiration of the assessment, the Kickstarter market would reopen and the cycle would start again, requiring payment to get the assessment reviewed and brought up to date with current science. . The second round would have the same two tier structure, but likely at a lower total commitment threshold for the review than for the first round assessment from scratch. Of course if a Profiler has excess capacity, they could decide to carry out the assessment even before the first threshold has been met.

The Exchange has a Diverse Audience

Representatives of all of the GreenScreen® Profilers – ToxServices,[34] SciVera, and NSF International[35] – and C2CPII have expressed interest in engagement in this Exchange concept with HBN. The US EPA has developed a portal, ChemView,[36] for web access to structured endpoint specific hazard level data from DfE alternatives assessments and has expressed interest in sharing access to the DfE assessments stored there. Once the EPA completes development of API access tools, the Exchange could integrate access to DfE assessments with access to all GreenScreen, C2C and other assessments.

The Exchange aspect of the Data Commons project can engage a wide range of users directly and indirectly and do much to accelerate use of assessed improved chemistry in industry. The Exchange can provide a direct portal for chemical assessments for formulators and product designers. It also can provide APIs to integrate these assessments in the material performance parameter datasets within the CAD design tools those designers already use such as Autodesk's Product Design Suite[37].

The Exchange can facilitate manufacturers seeking to establish a claim of avoidance of toxics in the marketplace through providing assessments for use with disclosure support tools. This includes public B2C[38] marketplace tools such as the Health Product Declaration Builder and HBN's Pharos Project. It also includes the B2B marketplace with both the open supply chain system proposed by GreenBlue's Material IQ and existing proprietary supply chain and compliance management tools such as those

[33] Kickstarter uses crowdfunding to fund projects. Individuals commit to pay a portion of what is needed to fund the project. They are not charged until sufficient pledges are received to fully fund the project. https://www.kickstarter.com

[34] www.toxservices.com

[35] www.nsf.org

[36] http://www.epa.gov/oppt/existingchemicals/pubs/chemview.html

[37] http://www.autodesk.com/suites/product-design-suite/overview

[38] B2C = Business to Consumer, B2B = Business to Business

provided by enterprise software firms like SAP,[39] Siemens,[40] PTC,[41] Oracle[42] and Rubali IHS[43].

Purchasing specifiers, building designers and owners can use the assessments to better screen the products they choose through tools like the HPD, Pharos, Building Information Modelling (BIM) software produced by Autodesk, and others. Finally, policy-makers, policymakers can use the increasing number of assessed substances to more confidently establish policies to incentivize the use of inherently safer ingredients in products.

> ** *Data Commons Recommendation*: Undertake research to develop a business model that could work to support a Chemical Hazard Assessment Exchange. Integrate development of the Exchange with a List Translator search tool, such as the Pharos Chemical & Material Library, to provide seamless access to List Translator results and Full Assessments. Use APIs to leverage the Exchange to other related systems, such as the HPD, BIM systems and more.

Robust hazard-based assessment tools have the potential to improve product formulations. This potential is not fully realized because of the small number of existing hazard assessments, and obstacles that slow the production of new assessments. An Assessment Exchange in the Data Commons could facilitate a rapid development of new assessments, and widespread access to them could facilitate informed substitutions.

2. Life Cycle Hazard Information

Hazards from a substance may result not only from direct exposure to the chemical during use. Impacts may occur from other related substances or reaction products occurring throughout the chemical's life cycle from its synthesis or extraction, to its ultimate disposal. Studies of occupational exposures, releases in fenceline communities, biomonitoring, public health surveillance and environmental monitoring can provide relevant insights into these hazards. This life cycle information is even more difficult for decision makers to obtain than direct hazard information.

The Data Commons can establish a repository for life cycle information cross-referenced to the chemicals, or groups of chemicals, to which it applies. The Data Commons can collect references to these types of studies in numerous ways. It can establish linkages with the academic, public health, governmental, or non-governmental organizations that generate them. It can also support curated crowdsourced monitoring of journals to find and screen appropriate studies and to develop summaries to help interpret them for policy and decision makers.

> ** *Data Commons Recommendation*: Develop a life cycle chemistry repository in the Commons for process chemistry and transformation product information.

3. Policy Information

Policy and purchasing decision-making can be usefully informed by summaries of other public and private policies. The Data Commons can also aggregate **Restricted Substance Listings (RSLs)** that identify public and private commitments to research, manage or restrict use of chemicals of concern.

Governmental agencies, for-profit companies and non-governmental organizations each may publish lists of chemicals or groups of chemicals targeted for policy action based upon their assessment of a range of health, environmental and other factors. These listings could cover regulatory or advisory actions, purchasing specifications, research agendas and more. Regardless, access to these lists can be helpful

[39] www.SAP.com
[40] www.siemens.com
[41] http://www.ptc.com
[42] www.oracle.com
[43] http://www.rubali.com

for others attempting to establish complementary policies. Summary reviews of these policy actions can provide useful guidance for policy makers and designers .

> ** *Data Commons Recommendation*: Link policy databases and Restricted Substance Listings (RSLs) to facilitate a comprehensive view of a chemical's policy status.

4. A Platform for Collaborative Knowledge Production

All of the data identified, aggregated and summarized in the Data Commons will present a daunting amount of information for a policymaker, product designer or project decision maker seeking guidance. The Data Commons will complement its data management tools with social engagement strategies to involved the community in the collection, assessment and curation of this information. We anticipate that the Data Commons will host a range of active discussions. Some of them will be deeply detailed and technical—e.g., pointing out important new findings and discussing their validity and ramifications. Others will be at higher interpretive or organizational levels—e.g. identifying emerging trends, connecting the dots, and planning or coordinating work. Curated comment boards and -wiki-style editable descriptive sections can help newcomers understand the purpose and structure of the system, as well as the meaning of the data and its implications for human health and related social issues. "Disambiguation" pages for commonly-confused chemical identities are a concrete example of a type of collaborative document that would prove very useful.

> ** *Data Commons Recommendation*: Create descriptive wiki pages and facilitated discussion areas for chemicals of interest to support collaborative development of resources policy discussions—such as for technical assistance, education, broader communication, research and analysis, or discussion of group efforts.