Sustainable and Healthy Communities Research Program

Strategic Outputs FY16-FY19

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DRAFT

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Acronyms

CADDIS	Causal Analysis/Diagnosis Decision Information System
CCAT	Community Cumulative Assessment Tool
C-FERST	Community-Focused Exposure and Risk Screening Tool
C-LINE	Community LINE Source Model
C-PORT	Community Modeling System for Near PORTs
CSAS	Community Sustainability Analysis System
DASEES	Decision Analysis for a Sustainable Environment, Economy, and Society
DDES	Development and Deployment of Environmental Software
DOSII	Database of Sustainability Indicators and Indices
EGS	Ecosystem Goods and Services
ESML	EcoService Models Library
EQI	Environmental Quality Index
FEGS	Final Ecosystem Goods and Services
FEGS-CS	Final Ecosystem Goods and Services Classification System
HIA	Health Impact Assessment
HWBI	Human Well-being Index
iEMSs	International Environmental Modelling and Software Society
IPCC	Intergovernmental Panel on Climate Change
NCEA	National Center for Environmental Assessment
NCEE	National Center for Environmental Economics
NCER	National Center for Environmental Research
NCP	National Oil and Hazardous Substance Contingency Plan
NERL	National Exposure Research Laboratory
NHEERL	National Health and Environmental Effects Research Laboratory
NESCS	National Ecosystem Services Classification System
NRMRL	National Risk Management Research Laboratory
OAR	Office of Air and Radiation
OCHP	Office of Children's Health Protection
OECA	Office of Enforcement and Compliance Assurance
OEI	Office of Environmental Information
OEJ	Office of Environmental Justice
OITA	Office of International and Tribal Affairs
OLEM	Office of Land and Emergency Management
OSC	Office of Sustainable Communities
OSIM	Office of Science Information Management
OW	Office of Water
P3	People, Prosperity and the Planet Student Design Competition
RESES	Regional Sustainable Environmental Science
ROE	Report on the Environment
SBIR	Small Business Innovation Research
SHC	Sustainable and Healthy Communities
StRAP	Strategic Research Action Plan

Glossary - Research Planning Definitions

Outcome – the expected result, impact, or consequence that EPA and other stakeholders will realize from ORD research.

Output – Outputs are Products (synthesized and/or translated) in the format needed by the end user. Outputs should be defined, to the extent possible, by partners/stakeholders during problem formulation and are responsive to the end user's decision context.

Partner - End User of ORD's research that is within the Agency. This includes Program Offices, Regional Offices, ORD Laboratories and Centers, and other National Research Programs.

Product – A deliverable that results from a specific Project or Task. This may include (not an exhaustive list) journal articles, reports, databases, test results, methods, models, publications, technical support, workshops, best practices, patents, etc. These may require translation or synthesis for inclusion as an Output.

Project – An integrated set of research Tasks (Activities/Studies) that must be completed to produce the Products and Outputs necessary meet the partner/stakeholder needs. Each Project has a Project Lead and defined start and end dates for completing Products and Outputs as indicated by milestones. This is the level of research that may be described in a programmatic quality management plan.

Science Question(s) - Scientific or technical question that identifies the critical research needed within each of the Research Themes. They are developed during Problem Formulation and drive development of the Research Projects.

Stakeholder - Broad ranging parties external to EPA that may include federal agencies; international, state, local or tribal governments, universities, NGOs, citizen groups, communities, etc. who are interested in, affected by, or will be an End User of ORD's research.

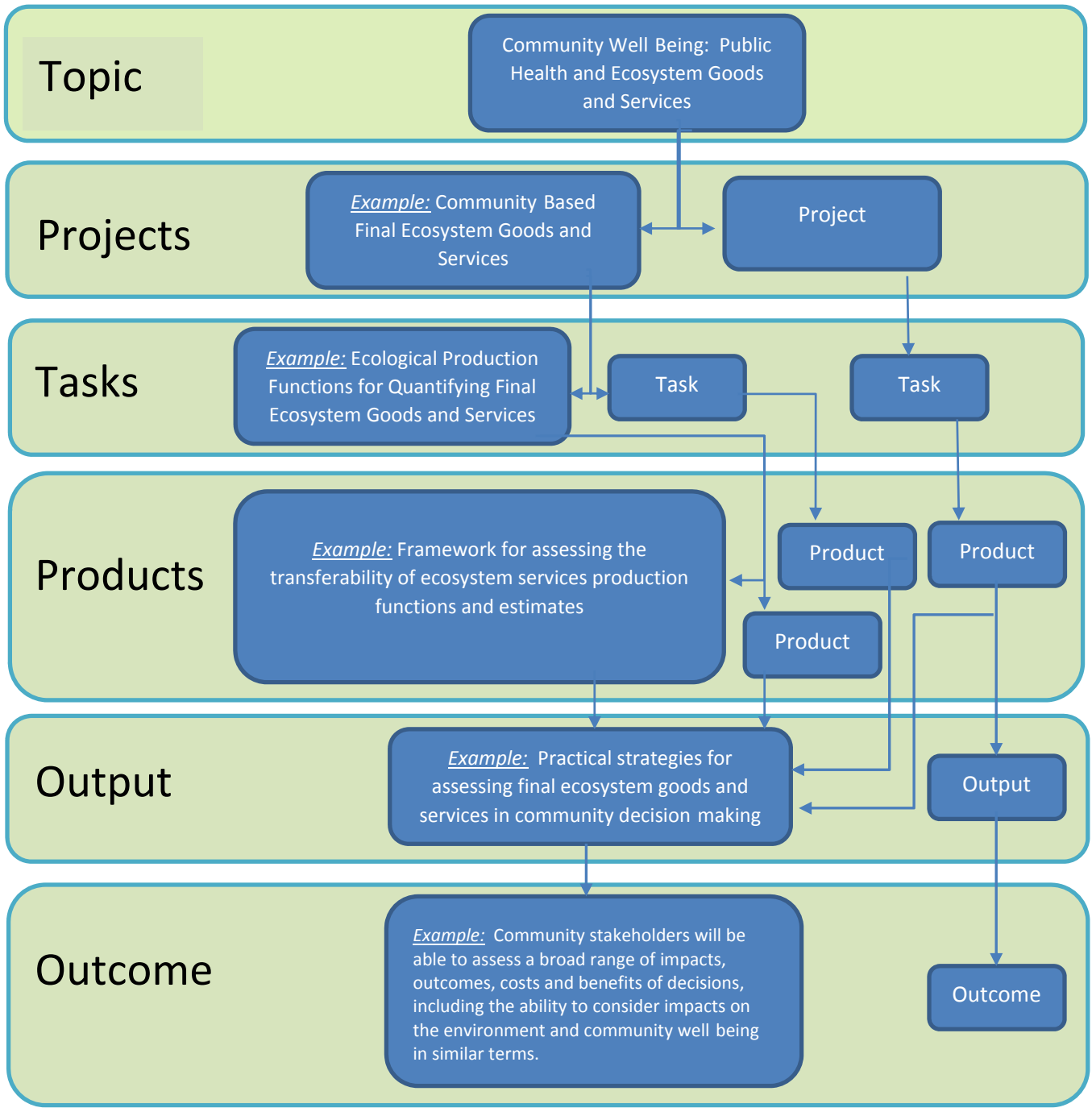
Strategic Research Action Plan (StRAP) – Outlines ORD's role in achieving EPA's objectives and cross-cutting strategies, as laid out in the EPA Strategic Plan. These plans describe the research vision, objectives, topics, and expected accomplishments, as well as explains the programs' efforts to collaborate with EPA partners and stakeholders.

Task (Activity/Study) – The discrete actions that comprise a Research Project. Each Task has a Task Lead, produces specified Products, and has a specified start and end dates. Completion of a Tasks may be a milestone. This is the level of research which is typically described in a quality assurance project plan.

Tool – Tool is a broad term. Tools assist partners and stakeholders in addressing environmental and health issues. Tools include interactive web-based applications such as simple calculators and scenario analysis applications. Tools can include data from physical, natural, and social sciences.

Topic – An idea that focuses and groups similar research needs identified during problem formulation.

Figure 1: Research planning definitions and hierarchy



Introduction

Community sustainability is often defined by the desire to meet today's needs without compromising the quality of life for future generations. As communities face increasingly complex problems, making progress toward sustainability requires the right mix of policies and investments that protect our environment, are socially just, improve public health, support economic vitality, make the most efficient use of public dollars, and enhance the quality of life for community residents.

Providing science that can help communities make better decisions is at the heart of EPA's Sustainable and Healthy Communities (SHC) Research Program. SHC provides useful science and tools for decision makers at all levels to help communities advance sustainability as well as achieve regulatory compliance. The SHC research program also seeks more cost-effective ways to address existing sources of land and groundwater contamination. SHC is collaborating with partners to conduct research that will result in science-based knowledge to guide decisions that will better sustain a healthy society and environment in America's communities. More information about SHC's research program can be found in the SHC Strategic Research Action Plan (StRAP) for FY16-19 (https://www.epa.gov/research/sustainable-and-healthy-communities-strategic-research-action-plan-2016-2019).

This output document summarizes the SHC outputs that will be completed over the next four years. It is intended to be useful for SHC researchers, ORD senior managers and program and regional staff. *Outputs* are the strategic goals set out by the SHC program and are meant to meet priority science needs (Figure 1). ORD's Labs and Centers will design and implement research for the SHC program that meet these needs. At the same time, these Outputs will serve as synthesis products to communicate major accomplishments of the SHC research program to partners and stakeholders.

SHC's strategic Outputs are listed below organized by four Topics and eleven Projects. Lab and center research will feed into the completion of these outputs, which we believe address priority science needs of EPA Programs and Regions as well as key SHC external stakeholders. Further details of that research are included in the project and task plans developed by the Project Leads. As always, completion of these outputs is contingent on resource availability.

SHC Outputs

SHC's strategic Outputs are listed below. Each Output has a title, expected completion date, associated Outcomes and Science questions to provide context, a brief description, intended impact of the research and development, and intended audience for the research.

Topic 3 Outputs – Sustainable Approaches for Contaminated Sites and Materials Management

Topic Outcome: Communities, working through the US EPA and their respective delegated parties, will improve the efficiency and effectiveness of addressing contaminated sediments, land, groundwater, and vapors and will enhance sustainable materials management, to support community public health and their resources toward development and revitalization and better management of materials.

Topic Outcome: Communities, working through the US EPA and their respective delegated parties, will improve the efficiency and effectiveness of addressing land and water contamination to support community public health and hasten the recovery of their impacts resources.

Project 3.61: Contaminated Sites

Project Outcome: Communities, working through the US EPA and their respective delegated parties, will improve the efficiency and effectiveness of addressing contaminated sediments, land, groundwater, and vapors to support community public health and their resources toward development and revitalization

Methods for characterizing and remediating contaminated ground water, vapors, and sediment sites that have single or multiple contaminants to improve community public health and their resources and facilitate revitalization (Output 3.61.3)

Expected completion date: FY 16
Output Lead: Dave Jewett (NRMRL)
Format: Research Highlights Summary for internal and external audiences

Science questions:

- How can contamination, from single or multiple sources, be effectively characterized and optimally remediated to protect community public health and their resources and for safe reuse of sites?
- What methods can be developed or applied to assess contaminated sediments and to measure the short-and long-term effectiveness of remediation?

Description: This output will provide an integrated approach to evaluate and mitigate subsurface contamination, focusing on three key components. First, it will summarize research on contaminant fate and transport and the assessment of innovative in situ processes to stabilize and/or remove organics and inorganics. Second, the output will include improved sediment testing methods for assessment of toxicity and bioaccumulation, and it will demonstrate use of passive sampling to assist in determining clean-up approaches and evaluating remedy effectiveness. Lastly, this output will summarize practical approaches that ORD has developed to characterize and control vapor intrusion in buildings, including passive sampling, subslab probes, and soil gas measurements.

Impact: This output will provide scientific and technical methods, technologies, and strategies to help decision makers to decide on and implement effective and affordable remediation strategies to advance site-specific cleanup and revitalization efforts.

Target Audience: OLEM – Superfund, OW Groundwater Office, Regions, States, Tribes

Strategies and technologies for innovative assessment and remediation of contaminated sites - approaches to remediation, restoration, and revitalization (Output 3.61.4)

Expected completion date: FY19
Output Lead: Dave Jewett (NRMRL)
Format: EPA publication

Science question:

- What are effective approaches to mitigate contamination across media (water, land, vapors, and sediments) in an integrated way and to evaluate remediation strategies for reducing risks to human and ecosystem health?

Description: Many communities struggle with a legacy of contaminated land, and advancing sustainability includes cleaning up contaminated sites and developing technical solutions to remediation as a fundamental stage in moving towards restoration and community revitalization. This output will provide a resource to assist site managers to more effectively evaluate and manage contaminated sites by summarizing remedial strategies and technologies, regardless of media or contamination. It will consider cost-effectiveness of remediation strategies and innovative uses of remediation technologies across media (e.g., can approaches to cleaning ground water be used to effectively clean up sediment contamination?). This output may consider metrics evaluating remediation, restoration and revitalization efforts from other projects as well.

Impact: This output will help decision makers to decide on and implement effective and affordable remediation, restoration and revitalization strategies to advance site-specific cleanup and revitalization efforts.

Target audience: OLEM – Superfund, RCRA, and Brownfields Programs, OW/OGWDW-Groundwater Program, Great Lakes National Program Office, Regions, States, Tribes, and Communities.

Understanding community exposure to contaminated sites, sediments, and groundwater (Output 3.61.5)

Expected completion date: FY19
Output Lead: Dave Burden (NRMRL)
Format: EPA Report

Science question:

- What are some of the temporal and spatial impacts of contaminated sites on exposure, public health and the environment?

Description: This output will highlight SHC tools for evaluating the temporal and spatial impacts of contaminated sites on community public health and discuss potential impacts demonstrated through application of these tools. The research will consider the impacts of climate change (e.g., flooding) on contaminated sites, nearby environs, and vulnerable populations, impacts of contaminated groundwater on community drinking water quality and quantity; impacts from contaminated groundwater and soil gas on indoor air in homes and schools from vapor intrusion; and potential impacts to community public health from reuse of contaminated sites. This effort will involve the assessment of metrics for evaluating the efficacy of remediation solutions, particularly related to climate change vulnerability.

This output builds upon the spatial-temporal research and foundational research contributing to the creation of these tools in this project as well as research from other SHC projects, including potentially the indicators work in Project 2.64 that may be mined for metrics to evaluate remediation efforts in the context of climate change.

Impact: This output will provide spatial-temporal tools to help users visualize and understand potential impacts of site contamination on the environment and community public health as well as impacts of climate change on contaminated sites as they relate to community public health. It will demonstrate how these tools can be used and point users to user guides and reference materials where they can learn to use these tools themselves leading to more efficient and effective management of contaminated sites.

Target audience: OLEM – Superfund, Brownfields, RCRA, OW Groundwater Office, OEJ, Regions, States, Tribes

2020 Five-year synthesis report on scientific contributions of ORD's Technical Support to Superfund and other contaminated sites (Output 3.61.2)

Expected completion date: FY 20
Output Lead: John McKernan (NRMRL)
Format: Synthesis report of ORD's Technical Support Center scientific and technical contributions from 2015-2019

Science questions:

- What is the state-of-the-practice and associated performance in remediation strategies to manage contaminated sites that can inform future remediation strategies?
- How can research to support decision-making with respect to site remediation at the regional, state, and tribal level be better translated so that it is accessible, useful, and transparent?

Description: This output will provide an updated report on major findings of ORD technical assistance in contaminated site cleanups. This will provide an assessment of approaches to address contaminants by media (e.g. solvents, metals), including ground water, sediments, land, and vapors. Additionally, it will provide an assessment of remediation strategies of major site types such as mining or landfills.

Impact: The technical support program greatly enhances state-of-the-science technology transfer between ORD, OLEM, and Regions, providing scientific and technical approaches, methods, technologies, and strategies that are an essential component to cleaning up contaminated sites efficiently and effectively.

Target Audience: OLEM Superfund Program, Regions, States, Tribes

Project 3.62: Environmental Releases of Oil and Fuels

Project Outcome: The US EPA, in collaboration with other Federal Agency partners, states and communities, will improve the responsiveness, control, and remediation of fuel and oil spills to protect community public health and their impacted resources.

Tools for improved characterization, response and remediation of oil and fuels, to improve emergency response and other cleanup activities (Output 3.62.1)

Expected completion date: FY 16
Output Lead: Robyn Conmy (NRMRL)
Format: Published report

Science question:

- How can we better characterize, respond to, and remediate contamination from new as well as existing fuels and oils to minimize human exposures and environmental damage?

Description: This output will provide new conceptual and predictive tools to characterize and remediate contamination by fuels, and will also provide biological and chemical treatment approaches to improve effectiveness and timeliness of oil spill response and cleanup activities. Conceptual and predictive tools to assist in triaging sites for cleanup and the development of tools to protect community public health and reduce impacts to community resources so site remediation decisions can be more effective and timely. This work will advance community sustainability, especially by protecting and restoring water resources and ecosystems that have been impacted or contaminated by oil, benefitting public health and environmental resources. This effort will build on previous work with fuel and oil contamination, with attention to newer types of fuels and oils, and the environments in which they will be present.

Impact: Improved protocol and guidelines to improve regulations and response efforts to protect communities from exposure to environmental releases of oils and fuels. More efficient and effective management of oil and fuel spills.

Target audience: OLEM (OUST, OEM), OW, OECA, Regions 1-10, States (Underground Storage Tank Regulatory Agencies, Association of State and Territorial Solid Waste Management Officials, Interstate Technology Regulatory Commissions and Tribes, Department of Fisheries and Oceans Canada, Tribes.

Tools for evaluating temporal and spatial impacts of fuels/oils site cleanup on public health and the environment, for use in oil spill response and site remediation, restoration and revitalization (Output 3.62.2)

Expected completion date: FY17
Output Lead: Jim Weaver (NRMRL)
Format: Published report

Science question:

- How can we better determine the type, degree and extent of impacts of fuel and oils spills on community public health and their resources, especially those that are temporally and spatially removed from the original contamination?

Description: This output will provide tools to help communities and site managers to better evaluate and predict the potential public health impacts of fuels and oil spills, so they can identify and address those impacts to advance public health through prevention measures and improved response technologies to minimize impacts to their resources. This effort will build on previous contaminant fate and transport characterization work, which is necessary to evaluate exposure to populations and impacts to ecosystem services that will affect human health and the environment. This will involve assessment of appropriate metrics for oil spill response, and for remediation, restoration, and revitalization, in the context of potential changes due to various factors, such as climate change.

Impact: More efficient and effective management of oil and fuel spills.

Target audience: OLEM (OUST, OEM), OW, OECA, Regions 1-10, States (Underground Storage Tank Regulatory Agencies, Association of State and Territorial Solid Waste Management Officials, Interstate Technology Regulatory Commissions) and Tribes, Department of Fisheries and Oceans Canada, Tribes.

Synthesizing the science and protocols necessary to advance our understanding and use of spill countermeasures listed on the NCP Product Schedule and evaluating oil standards and dispersant effectiveness (Output 3.62.3)

Expected completion date: FY19
Output Lead: Robyn Conmy (NRMRL)
Format: Published report

Science question:

- How can we better evaluate and assess the approved oil spill countermeasure tools in order to minimize human exposures and environmental damage?

Description: This output will provide a synthesis of new or revised protocols for efficacy testing of product categories of the NCP (National Oil and Hazardous Substance Contingency Plan) Product Schedule such as dispersants, surface washing agents and solidifiers. The ability to assess efficacy of spill products improves the effectiveness and timeliness of oil spill response and cleanup activities. Assessment of spill remediation product effectiveness under varying environmental conditions assists in triaging sites for cleanup and the development of tools / approaches to protect community public health and reduce impacts to community resources. This work (1) advances community sustainability, by protecting and restoring water resources and ecosystems that have been impacted or contaminated by oils or fuels, and (2) improves our understanding of the transport, behavior, fate and effects of spilled oils. This effort will build on previous work with protocol development, with attention given to product performance using the new proposed EPA reference oils to be selected in FY17 by the OLEM Program Office who maintains the Product Schedule.

Impact: By assessing the efficacy of spill products this output will help improve the effectiveness and timeliness of oil spill response and cleanup activities.

Target Audience: OLEM

Development and application of models of hydrocarbon transport to reduce the backlog of sites with UST/LUST (Output 3.62.4)

Expected completion date: FY19
Output Lead: Jim Weaver (NRMRL)
Format: Published report

Science question:

- How can we better characterize, respond to, and remediate contamination from new as well as existing fuels and oils, and develop tools to minimize human exposures and environmental damage?

Description: This output provides new approaches to understanding, predicting and evaluating transport from releases of petroleum-hydrocarbon-based fuels. Because there are always uncertainties associated with transport in the subsurface, the approaches will embed uncertainty analysis and automatic reporting of results. The end-point of the research is an improved understanding of transport that directly translates into reduced remediation costs, coupled with the provision of tools that allow state agencies to perform advanced assessments. Thus, site remediation decisions can be more effective and timely. This work will advance community sustainability by restoring contaminated ground water. With their uncertainty analysis capability the tools will have capability for forward-looking analyses which enhance community planning

around water resource availability. Because contamination of ground water is linked with vapor intrusion, the model approaches will build upon the PVIScreen model produced under Output 3.62.2 in FY17. Thus the model will address the two main exposure pathways: private-well drinking water and indoor air contamination in a complete fashion. Outreach and training is a necessary part of tech transfer for these products, so conference presentations, user documents and webinars are planned as part of the effort.

Impact: This output will provide an improved understanding of hydrocarbon transport. This will directly translate into reduced remediation costs, coupled with the provision of tools that allow state agencies to perform advanced assessments resulting in site remediation decisions that will be more effective and timely. This work will also advance community sustainability by restoring contaminated ground water.

Target Audience: OLEM - OUST

Project 3.63: Sustainable management of materials to support community sustainability

Project Outcome: The US EPA, in collaboration with states, and communities will enhance sustainable materials management, and the cyclic use of resources to promote and protect community public health, ecosystem services, and economic development.

Sustainable materials management options for industrial, construction/demolition, and municipal materials including reduction, reuse, and recycling/repurposing to protect and promote community public health and sustain or restore healthy environments. (Output 3.63.1)

Expected completion date: FY17
Output Lead: Thabet Tolaymat (NRMRL)
Format:

Science questions:

- What are the optimal approaches to sustainably manage materials used by municipalities, industry, and construction and demolition in an integrated way to protect public health and the environment?
- How can methods to reduce waste streams using principles of life cycle assessment and sustainable materials management be made more efficient and effective for communities (e.g. separation of waste streams and targeted reuse or minimization steps)?
- Using a life-cycle approach, how can solid wastes be reduced, reused, recycled and disposed or managed in order to conserve land, minimize contamination of land, minimize emissions to air, land, and water, and yield equitable co-benefits throughout a community?

Description: This output will evaluate conventional and innovative methods for managing materials from industrial, municipal, construction/demolition sectors. This research addresses management alternatives to advance the reduction in extraction of materials, e.g. materials

reduction, beneficial reuse, and enhanced recyclability, to advance sustainability goals for materials, as well as pollution reduction, energy use and economic costs/co-benefits. This effort will build on previous materials management research, and will utilize life cycle analysis methods, as well as evaluation of human health and resource impacts.

Impact: This Output will enable society to: advance materials management alternatives that minimize lifecycle cost, energy use and environmental impacts; reduce unnecessary extraction of non-renewable natural capital, and maximize beneficial and sustainable use of renewable and non-renewable materials through their lifecycle.

Target audience: OLEM, Regions, States, Tribes, communities, industries

Integrated approaches for sustainable materials management (Output 3.63.2)

Expected completion date: FY19
Output Lead: Thabet Tolaymat (NRMRL)
Format:

Science questions:

- Using a life-cycle approach, how can materials be reduced, reused, recycled and disposed or managed in order to conserve land, minimize contamination of land, minimize emissions to air and water, protect workers, and yield equitable co-benefits throughout a community?
- How can this be accomplished across media (water, land, subsurface vapors, and sediments)?

Description: This output will provide a framework of integrated approaches to assist materials users, regulators and waste managers to more effectively evaluate and manage materials across both their lifecycle and media, as well as to provide regulators with exemplary state-of-the-art practices.. Such knowledge will demonstrate holistically-beneficial alternatives of cyclic approaches compared to linear cradle-to-grave approaches. Sustainable materials management approaches will allow decision makers to more easily decide on and implement effective and affordable alternatives to landfilling community-generated "wastes" and better advance SMM, community sustainability, public health and economic stewardship of resources. This effort will build on previous materials management research, especially 3.63 Output 3, life cycle assessment methods and the Materials Management sector paper produced in 2015 under the previous research cycle's Output 4.1.4.

Impact: Decision makers and industries can better evaluate, choose and implement effective and affordable materials management strategies to seize co-benefits, advance community sustainability, and foster improved public health and the holistic stewardship of resources.

Target audience: OLEM, industries and other material users/processors, Regions, States, Tribes, communities

Tools for evaluating temporal and spatial impacts of materials management practices on public health and the environment, for use in decision making by community stakeholders, including local government, industries, and regulators at all levels of governance, to improve the use of resources and minimize impacts throughout the lifecycle of materials use (Output 3.63.3)

Expected completion date: FY18
Output Lead: Thabet Tolaymat (NRMRL)
Format:

Science questions:

- How can we best determine the temporal and spatial impacts of materials management practices on public health and the environment throughout the lifecycle of materials,, including consideration of changes expected with climate change?
- How can materials be managed (i.e. in order of preference: reduced, reused, recycled or disposed) such that they best advance sustainability by conserving land, minimizing contamination of land, minimizing emissions to air, land, and water, and yielding equitable co-benefits throughout a community?

Description: This output will provide tools to determine the temporal and spatial impacts of material management practices on community public health and their resources including: impacts to community drinking water quality and quantity from contaminated ground water; impacts to indoor air in homes and schools from contaminated ground water and soil gas from material management operations; impacts to land from management operations, including ecological restoration, and resource loss through disposal. These tools will help communities and materials users to better evaluate and predict the potential public health and environmental impacts of material management practices. This effort will build on previous materials management research, and it will include assessment of appropriate metrics for restoration and revitalization of contaminated sites, in a context of potential changes due to various factors, such as climate change.

Impact: These tools will help communities and materials users to better evaluate potential public health and environmental impacts of materials management practices. This will facilitate a more complete evaluation of the full lifecycle costs and impacts of traditional practices, and will identify ways to work toward a materials use cycle, which will minimize lifecycle costs and prevent impacts.

Target audience: OLEM, OW, OEJ, OCHP, industries and other material users/processors, Regions, States, Tribes, communities