



2015 Sustainability Goals

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## **Sustainable Chemistry**

The Sustainable Chemistry Index

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## I. Executive Summary

Today's global challenges – which include climate change, water scarcity, food provision, declining ecosystem services, human development, and the overall transition to a sustainable society and planet – require solutions of unprecedented scale. In the decades ahead, these challenges also offer tremendous opportunity for organizations who can contribute to addressing them. In addition to public policy and behavior change, business and technology have a significant role to play in addressing these challenges.

Dow recognizes that chemistry can enable development of solutions to many of today's most pressing problems. To help strengthen this link between its science-based solutions and these global challenges, Dow created its sustainable chemistry concept, which applies life-cycle thinking to help evaluate the sustainability value delivered by its product and solutions. A key component of Dow's 2015 Sustainability Goals, this concept has helped Dow to drive a culture change toward understanding more holistically how its products and technology can address these global challenges.

As part of its 2015 Sustainable Chemistry goal, Dow developed the Sustainable Chemistry Index (SCI), a metric used to assess the relative sustainability performance of its product portfolio

based on the sustainability attributes of its products. The SCI defines the 2015 Goal target, which is to achieve 10% of the Company's sales from products "highly advantaged" by sustainable chemistry.

In 2013, Dow reached its 2015 Sustainable Chemistry target of achieving 10% of sales from highly advantaged products, marking a significant improvement from the baseline performance of 1.7% in 2007. Additionally, the Dow aggregate SCI score reached an all-time high of 24.4 points, up from the 2007 baseline score of 20.4. These accomplishments reflect the shift in Dow's portfolio toward products that deliver value to society based on their ability to address sustainability challenges like energy efficiency, food production, and water scarcity.

The increase in SCI performance during the 2015 goal timeframe reflects increased sustainability awareness within the Dow culture. This awareness has enabled Dow employees to better understand how to integrate sustainability into their roles, from informing business strategies to developing and communicating solutions that capture opportunities to improve sustainability. These actions demonstrate the value of the sustainable chemistry approach, which utilizes life-cycle thinking to identify products that help address sustainability challenges today, and helps position the company for success over the long term.

## II. Sustainability at Dow

According to the United Nations<sup>1</sup>, the population will grow to over nine billion people by 2050 – increasing global demand for healthy food, clean water, sanitation, shelter, mobility, education and healthcare. More specifically, by the time children born today enter their teens, the world will need 50 percent more food, 45 percent more energy and 30 percent more water, while learning to mitigate and adapt to climate change<sup>2</sup>. Society must begin preparing today for a future that holds these unprecedented global challenges, making the coming few decades pivotal for mankind and the planet. Dow sees these challenges as tremendous opportunities – to discover and create solutions that allow us to do more with less, to create societal value, to prosper, to advance the human condition, and to define a path towards a sustainable society and planet. To build a better world, we all must change the way we live, work and play. From Dow's perspective, businesses need to do what they do best: innovate, adapt and collaborate.

We are proud to say that Dow has long been – and remains – committed to doing our part by applying science and engineering expertise to create solutions to some of the world's greatest challenges.

## III. Dow's 2015 Sustainability Goals

Dow's approach to sustainability is to set clear and challenging goals, measure rigorously and report regularly. This bold commitment to accountability inspires innovation in the Company and builds respect among stakeholders and collaborators.

In 1995, Dow established its first set of 10-year goals to improve the Company's environment, health and safety (EH&S) performance and was recognized for a variety of achievements, including the number of lives saved and injuries prevented, as well as the amount of waste eliminated. In 2006, Dow set the bar even higher with the introduction of a more ambitious set of 2015 Sustainability Goals, which expanded beyond EH&S and focused on strengthening community relationships, continuing to improve product stewardship, innovating to solve world challenges and reducing the Company's global footprint. Each of the challenges identified can be impacted through material science and chemistry.

These 2015 Sustainability Goals drive the way that Dow approaches business and sustainability by identifying ambitious, measurable benchmarks:

**Sustainable Chemistry.** By 2015, Dow will increase the percentage of sales to 10 percent for products that are highly advantaged by sustainable chemistry.

**Breakthroughs to World Challenges.** Dow is actively working toward – and committed to achieving – at least three breakthroughs by 2015 that will significantly help solve world challenges in the following areas:

- Energy and Climate Change
- Water
- Food
- Housing
- Health

**Addressing Climate Change.** Dow will maintain all greenhouse gas emissions below 2006 levels.

**Energy Efficiency and Conservation.** Dow will reduce its energy intensity 25 percent by 2015.

**Product Safety Leadership.** Dow will publish product safety assessments for all products by 2015.

**Contributing to Community Success.** By 2015, 100 percent of Dow sites where the company has a major presence will have achieved individual community acceptance ratings.

**Local Protection of Human Health and the Environment.**

By 2015, Dow will achieve on average a 75 percent improvement of key indicators for EH&S operating excellence from 2005 baseline.

<sup>1</sup><http://www.un.org/en/development/desa/news/population/un-report-world-population-projected-to-reach-9-6-billion-by-2050.html>, accessed Sep 2, 2014  
<sup>2</sup>United Nations Secretary-General's High-Level Panel on Global Sustainability (2012). Resilient people, resilient planet: A future worth choosing, Overview. New York: United Nations.



## IV. 2015 Sustainable Chemistry Goal

As a central element of this effort, the 2015 Goal on Sustainable Chemistry focuses on understanding the contribution made by Dow's products toward solving sustainability challenges, and on driving a culture change within Dow to better evaluate and understand this connection. This goal emphasizes the application of life-cycle thinking to understand the role of Dow's products in advancing sustainability.

The Sustainable Chemistry goal integrates the innovative application of science and technology with societal needs and challenges to identify, commercialize, and deliver solutions. A holistic understanding of the benefits and tradeoffs associated with Dow's products and solutions is facilitated by applying tools such as life cycle assessment (LCA)<sup>3</sup>, the Sustainable Chemistry Index, the Dow Chemical Sustainability Footprint Tool<sup>4</sup>, and the Themes of Sustainable Chemistry and Engineering<sup>5</sup>. Each of these tools has been further applied or developed anew under the Sustainable Chemistry goal. These tools have helped Dow to gain an improved understanding of the benefit of the sustainability attributes of current products and of the opportunities for innovation to address sustainability challenges.

Sustainable Chemistry has encouraged Dow to apply life-cycle thinking when considering the sustainability attributes of its products, to understand how Dow products can deliver solutions to help its customers meet their sustainability goals, and to recognize chemistry as an essential tool in developing solutions to the world's most pressing problems.

Under the Sustainable Chemistry goal, Dow has reported progress in several areas, including:

- Reporting its overall annual assessment of the Sustainable Chemistry Index, and performance against its percent of sales having sustainable chemistry advantages;
- Presenting and publishing life cycle assessment studies that are validated independently by an external stakeholder, on existing or planned Dow products;
- Providing ongoing updates on promising areas of research and investments and collaborations that spur sustainable chemistry innovation; and
- Promoting sustainable chemistry internationally through student prizes and Dow employee awards under the Dow Sustainability Innovation Student Challenge Award (SISCA) and Dow Sustainability Innovator Award programs.

<sup>3</sup> International Standard ISO 14040, "Environmental management – Life cycle assessment – Principles and framework", 2006; International Standard ISO 14044, "Environmental management – Life cycle assessment – Requirements and guidelines", 2006.

<sup>4</sup> Russell, D. A. M., Shiang, D. L. ACS Sustainable Chem. Eng. 2013, 1, 2–7

<sup>5</sup> Hunter S., Helling, R., Shiang D. Integration of LCA and Life-Cycle Thinking within the Themes of Sustainable Chemistry & Engineering, in Life Cycle Assessment Handbook: A Guide for Environmentally Sustainable Products, Mary Ann Curran (ed.), Scrivener, 2012, pp 369–390

### What is Sustainable Chemistry?

Sustainable chemistry involves the application of life-cycle thinking to the products and solutions Dow brings to society, in order to understand how to use resources more efficiently, minimize its footprint, provide value to its shareholders and stakeholders, deliver solutions to its customers, and enhance the quality of life of current and future generations. Sustainable Chemistry is a lens through which Dow examines its products, to better understand the role of those products in addressing sustainability challenges. It is a concept that identifies the existence of global sustainability challenges, applies Dow's technology and innovation capabilities to develop products and solutions that address these challenges, and recognizes that chemistry has an essential role to play in advancing sustainability for society.

The successful application of Sustainable Chemistry results in commercially viable products that help society to address sustainability challenges related to areas such as climate change, water scarcity, food provision and safety, and healthy societies.

Sustainable Chemistry differs from Green Chemistry<sup>6</sup> in that Sustainable Chemistry is a general concept that seeks to understand and optimize the role of a chemical product in addressing sustainability challenges. Green Chemistry, on the other hand, seeks to apply a set of well-defined principles to the design and development of chemical products and processes. In this sense, Sustainable Chemistry can be advanced by applying the tools of Green Chemistry to develop new products and processes that help to solve sustainability challenges.

Recognizing the utility of the principles of Green Chemistry and Green Engineering towards advancing Sustainable Chemistry, Dow has developed simplified Themes of Sustainable Chemistry and Engineering,<sup>3</sup> which cast these principles into four simple themes that can be used by its researchers towards developing new products and processes that advance Sustainable Chemistry.

<sup>6</sup> P. T. Anastas, J. Warner, Green Chemistry: Theory and Practice, London, Oxford University Press, 1998.

## V. The Sustainable Chemistry Index

A key component of the Sustainable Chemistry goal is the Sustainable Chemistry Index (SCI). The SCI was developed as a tool to quantify the relative sustainability performance of Dow's product portfolio based on eight categories related to product sustainability. The SCI is a semi-quantitative metric that is intended to provide a comprehensive sustainability assessment of Dow's products, based on questions that cover the full product life cycle; explore environmental, social, and economic aspects; and address product sustainability-related opportunity and risk. The SCI was created to:

- Provide a snapshot of the company's sustainability performance based on a life-cycle view of the company's entire product portfolio;
- Highlight sustainability advantages of existing products and opportunities for improvement;
- Set a quantitative goal for the company towards improved sustainability performance; and
- Help drive a sustainability- and life cycle-focused mindset into the organization.

The SCI comprises a series of questions that cover eight categories encompassing product sustainability attributes:

- **Renewable or Recycled content.** How much of the product was derived from renewable or recycled resources?
- **Resource Management.** How abundant and well managed are the resources that have been used to make the product?
- **Manufacturing Efficiency.** Are Dow's operations becoming more efficient relative to past performance?
- **Environmental Life Cycle Benefit.** Are there environmental benefits associated with the product when evaluated from a life cycle perspective?
- **Social Need Benefit.** Does the product address societal needs?
- **Manufacturing & Transportation Risk.** What is the level of manufacturing and transportation risk associated with the product?
- **Value Chain Risk.** What is the level of product risk related to the product value chain?
- **Public Policy and End of Life Risk.** What is the level of risk related to public policy initiatives and posed by product end-of-life scenarios?

Dow products are scored based on questions that cover these eight categories, and a resulting SCI score is assigned at the product level. Each category accounts for five possible SCI points, with a score of five being "full credit" for that category, so that the best possible SCI score is 40 points. Dow business SCI scores are calculated based on the SCI scores of all products sold by each business. Dow business scores are then similarly aggregated to produce an overall SCI score for the Company. Calculation and external reporting at the Company level allows one to track the overall progress of Dow in advancing Sustainable Chemistry through its products.

## VI. Sustainable Chemistry Index Goal Target



In addition to determining a relative measure of product sustainability performance within Dow, the SCI forms the basis of the goal target to achieve 10% of company sales as highly advantaged by sustainable chemistry. The SCI defines "highly advantaged" sales based on a threshold score; products scoring above this threshold score are considered to be highly advantaged sales and are counted toward the 2015 goal.

A target of 10% was set as the 2015 goal for percent of Dow sales that are highly advantaged by sustainable chemistry after establishing the highly advantaged threshold such that the 2007 level was only 1.7%. To grow the percent of highly advantaged sales, existing sales can remain highly advantaged and grow faster than the company sales, or new sales not previously highly advantaged can become highly advantaged based on improvement in their sustainability attributes.

Products that have sustainable chemistry advantages are products that score well across the life cycle, considering the eight categories of the SCI. Highly advantaged products are likely to contain renewable materials, deliver environmental benefits like efficient food production and water resource availability, address social needs like food production and drinking water, and have relatively low product sustainability risk. For example, Dow's first two solutions declared "Breakthroughs to World Challenges," Omega-9 Oils<sup>7</sup> and DOW FILMTEC™ ECO Reverse Osmosis Elements<sup>8</sup>, are both products that score as highly advantaged on the SCI.

<sup>7</sup> Dow Chemical, "Omega-9 Oils, Breakthrough to a World Challenge," <http://www.dow.com/sustainability/pdf/Omega-9-Oils-White-Paper.pdf>, accessed June 30, 2014.

<sup>8</sup> Dow Chemical, "Breakthrough to a World Challenge. DOW FILMTEC™ ECO Reverse Osmosis Elements," <http://storage.dow.com.edgesuite.net/dow.com/sustainability/world-water-day/44960-World%20ChallengeBrochure-Web.pdf>, accessed June 30, 2014.

In addition to setting and reporting against the Sustainable Chemistry Goal focused on a subset of the company’s sales, Dow felt it important to maintain focus on the sustainability performance of the entire Company. Accordingly, a commitment was made to report and track the overall SCI score for the Company. This approach has allowed Dow to keep its entire product portfolio in focus, and to drive sustainability discussions across all businesses units.

This dual approach – of setting a quantitative goal against highly advantaged sales while tracking overall company performance – has been reported regularly in Dow’s quarterly sustainability reports under the 2015 Sustainable Chemistry goal.

## VII. SCI Performance

The SCI has been updated annually since 2007, based on detailed scoring sessions that take place between business representatives, product application experts, and sustainability subject-matter experts. These discussions facilitate a sustainability dialogue regarding the product portfolio of each business and provide a forum for Dow leaders and experts to think critically and holistically about the sustainability attributes of Dow’s products.

Figures 1 and 2 show the results of the SCI from 2007 to 2013.

Figure 1 shows the overall growth in highly advantaged sales that was achieved over this timeframe. In the earlier years, as sustainable chemistry concepts began to be emphasized by the Company, Dow saw some initial growth in the percent of sales scoring as highly advantaged. In 2012 and 2013, however, significant progress was made towards the goal, and the 10% highly advantaged target was reached in 2013.

The overall progress displayed in Figure 1 reflects both the growth of highly advantaged products and the inclusion of additional products that became highly advantaged based on improvements in product sustainability attributes. Scoring improvements that have enabled some products to become highly advantaged have been related to improved manufacturing efficiency and to the realization of product sustainability opportunities in the areas of food, agriculture, water, automotive, infrastructure, energy, and consumer products.

### Highly Advantaged Sales

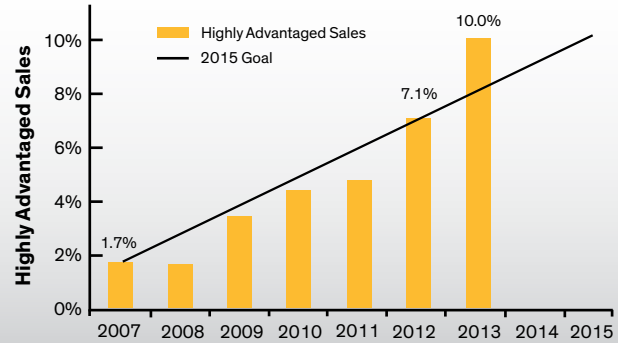


Figure 1. Highly Advantaged Sales as determined by the SCI, shown as percent of Company sales, from 2007 – 2013.

### Dow Aggregate SCI

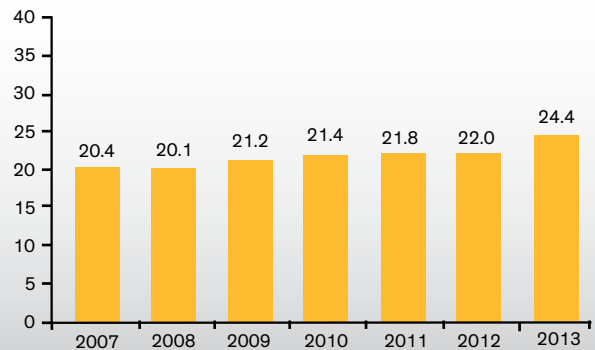


Figure 2. Dow Aggregate SCI score, 2007 – 2013. Scale reflects the total possible SCI score of 40 points.

Figure 2 shows an overall moderate increase in the SCI of the Company during this timeframe. After a slight dip of the company score in 2008, which occurred largely due to impacts on manufacturing efficiency from external events, the score has increased steadily each year. The improvement in aggregate SCI score over this timeframe has resulted most significantly from improvement in product scores related to environmental and social benefits, and from improvement in the operational efficiency of Dow’s manufacturing facilities. The small variation between years with respect to the total SCI scale of 40 points reflects the fact that companies like Dow, which operate assets with lifetimes of 30 years or more, can require several years in order to make a significant change in the total asset base and overall product portfolio produced by those assets.

## VIII. Impact of the SCI

The SCI has served as a metric that has helped to build awareness of sustainability throughout Dow's businesses and functions. It has worked to highlight key sustainability concepts within Dow, and to help Dow businesses identify both opportunities and risks related to sustainability across the portfolio. Among the greatest benefits of the SCI has been the sustainability-related dialogue and learning that been enabled through the scoring sessions and in follow-up discussion of the SCI scores throughout Dow businesses. These dialogues have helped to advise marketers on how to understand and communicate the sustainability-related attributes of their products; researchers on related opportunities that could be addressed through product innovation; and production engineers on opportunities for improved manufacturing efficiency. The synthesis of these discussions and summary of SCI performance has helped to inform business strategies on sustainability-related opportunities and risks across the product portfolio. Via these discussions and interaction across businesses and functions, the SCI has helped to drive culture change within Dow – not only building awareness of sustainability more broadly, but also helping instill throughout Dow a life-cycle mindset toward evaluating product sustainability.

## IX. Summary

As part of its 2015 Sustainable Chemistry goal, Dow developed a Sustainable Chemistry Index (SCI) to quantify the relative sustainability performance of its product portfolio. The SCI was used to set the 2015 Sustainable Chemistry goal of growing to 10% the percent of Dow sales that are derived from products highly advantaged by sustainable chemistry. Products that achieve a threshold score on the SCI are counted as being highly advantaged by sustainable chemistry.

In 2013, Dow reached its SCI target, growing highly advantaged sales from 1.7% in the baseline year of 2007 to 10.0% in 2013. Additionally, the aggregate SCI score for the Company increased from 20.4 to 24.4 over this time frame. These improvements in SCI scoring represent growth in sales of products that possess sustainability advantages, improvement in the sustainability attributes of products, introduction of new products that possess sustainability advantages, and improvement in Dow's manufacturing efficiency.



The SCI has helped to drive the sustainability dialogue across Dow businesses and functions, and has helped foster a culture of life-cycle thinking regarding the evaluation of the sustainability attributes of Dow products. As part of Dow's overall 2015 Sustainability Goals, and in combination with other life-cycle and sustainability tools implemented by Dow under the 2015 Sustainable Chemistry goal, the SCI is helping Dow to deliver solutions to sustainability challenges today, while positioning the company for success over the long term by embracing the tremendous potential of chemistry to solve the world's most pressing challenges.



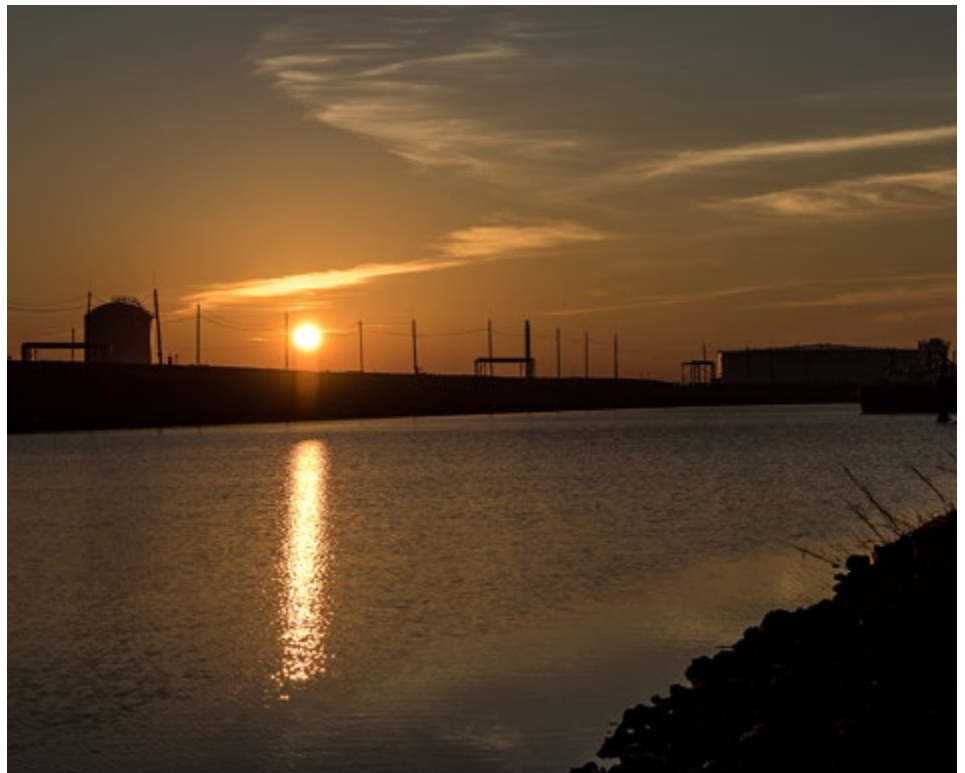


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## Science for a Sustainable World

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We only have one planet, with limited resources. So everything we do and how we do it matters. Dow is committed to minimizing our own footprint and to delivering solutions that help our customers and the rest of society do the same. The world needs solutions for big challenges like energy, climate change, water, food, housing and health. And Dow has some of the world's best scientists and engineers dedicated to solving world challenges through innovation. When we do that, it's not just good for the planet, it's also good for business. Dow remains committed to continuously improving its performance and publicly reporting its progress. Please visit [dow.com](http://dow.com) for the latest Dow sustainability, business and performance news, and to share your comments or submit questions.



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