


# Chapter 10

## Sustainable Chemistry and Pioneering Green Engineering Solutions: Green Chemical Processes for Industrial Application

**Shrikant M. Ghodse**

 <https://orcid.org/0000-0002-3082-7733>

*Principal K.M. Kundnani College of  
Pharmacy, Mumbai, India*

**Sakshi M. Gurav**

*Principal K.M. Kundnani College of  
Pharmacy, Mumbai, India*

**Gaurav R. Chopade**

*Principal K.M. Kundnani College of  
Pharmacy, Mumbai, India*


**Aamir M. Patel**

*Principal K.M. Kundnani College of  
Pharmacy, Mumbai, India*

**Kulbhushan A. Sasane**

*Independent Researcher, India*

**Hemant N. Akolkar**

 <https://orcid.org/0000-0003-0882-1324>

*Abasaheb Marathe Arts and New  
Commerce, Science College, Ratnagiri,  
India*

### ABSTRACT

*Green synthesis has become a reliable, sustainable, and ecological protocol for the synthesis of active pharmaceutical ingredients and their intermediates. Sustainable approaches include solvent free, catalysis, biocatalyst with state of art modified green methods explained. This chapter overview the various sustainable approaches for synthesis of various examples industrial important compounds. In addition to green approach case studies on pharmaceutical and agrochemical products and current updates were also explain.*

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# 1. INTRODUCTION TO GREEN SYNTHESIS

## 1.1 History of Green synthesis

A significant turning point in the global economic evolution was the expanding industrialization process. The environmental effects that the expansion of industrial activity could have on our planet were not taken into consideration by global government programs, despite their contribution to the improvement of quality of life. (Zygmunt *et al.*, 2009) (Marco *et al.*, 2019)

Due to excessive industrialization and increasing food production brought on by the population's fast growth, pollution, and resource depletion intensified. Natural resources were thus used as though there were no consequences for environmental issues. (Zygmunt *et al.*, 2009) (Marco *et al.*, 2019)

The novel “Silent Spring,” which was published in the 1960s, sparked a modern environmental movement. The historical novel has generated significant government initiatives characterized by concern about the dangers of over-exploitation of natural resources and has increased understanding of ecological awareness. John Kenneth Galbraith ranked the book as one of the most significant works of Western literature, while Robert Downs described it as “the book that changed America.” (Lutts, 2014) (Marco *et al.*, 2019)

Barry Trost, a chemistry professor at Stanford, was one of the pioneers of green chemistry. He initially proposed the idea of “atom economy” in 1973. Trost maintained that those in charge of creating chemicals should strive for elegant efficiency, which uses the maximum percentage of input atoms in the usable output, ideally leaving zero waste, rather than deeming a chemical process successful if it yields a usable product at a reasonable cost. When first offered, this idea looked idealistic, but more and more chemical processes, including biocatalysis, are currently being suggested that produce results that are somewhat like that objective. (Woodhouse, 2015) (Marco *et al.*, 2019)

The world first became aware of the potential harm that ecosystem degradation could do to humans in 1972 when the Stockholm Conference took place in Sweden. Several international conferences on the environment took place in the 1980s. To produce a report on global development and the environment, the UN established the World Commission on Environment and Development in 1983 following an assessment of the ten years of the planned activities at the Stockholm Conference. The world environment was under tremendous pressure at the time this commission was formed, and it was becoming increasingly clear that an extensive amount of development was unsustainable. (Marco *et al.*, 2019)

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