



Article

# Numerical Simulation of Dispersion Patterns and Air Emissions for Optimal Location of New Industries Accounting for Environmental Risks

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**Abstract:** One of the main reasons for air pollution is industrial plants releasing huge amounts of air pollutants in the form of gas emissions. The different chemical pollutants and their corresponding levels present in these emissions, and their proximity to the industrial source, have serious effects on the nearby ecosystems. Some of the industrial nuisances include noise, smoke, dirt, dust, odor and noxious gases, which have to be minimized (if possible, eliminated), especially if the location is desired to be used as a community site. When choosing locations at which to build either new industrial plants or new community sites, software can be used to assess both the short-term and long-term concentration profiles of the various detrimental air pollutants. In this study, the AERMOD model was used to find an optimal location to build a new plant in Toledo, Ohio, USA. Simulations were performed to study the pollutant emissions and their dispersion patterns for four different geographic locations situated away from an existing plant in this region. The AERMOD model, along with the EPA-6th View model, which is approved by the US Environmental Protection Agency (EPA), has been successfully used to assess the fate and transport of pollutants from the proposed new industrial plants. The hazard quotients from the analysis of the results for these four different geographic locations were assessed. The highest total non-cancer hazard indices of 18.7 and 13.2 were obtained for fisher adult and fisher child, respectively, in one of the four locations. The acute inhalation quotient risk was less than the target hazard index of 0.25 for all the four locations. With respect to the concentrations of several chemicals of potential concern (COPC), such as soil, produce, beef, chicken, milk and pork, the fourth location (farthest east) recorded the minimum range values compared to the other three locations.

**Keywords:** AERMOD; air pollution; dispersion; environmental risks; optimization; simulation

## 1. Introduction

Among the different types of pollution, gas emissions originating from industrial sources can be considered as a major source of air pollution. Pollutants in these emissions have a major impact on the ecosystems close to the industrial sources. Some of the common air pollutants include gases (e.g.,  $SO_2$ ,  $NO_x$ ,  $CO$ ,  $HCl$ ), volatile organic compounds, etc.), particulate matter (e.g., smoke, dust, ash, fumes, aerosols, pollen), radioactive materials and many others. Industrial activities, such as oil refining, the production of specialty chemicals, fertilizers, organic and inorganic chemicals and power generation, contribute to a significant share of the overall air pollution. Study of the dispersion of these air pollutants into the air, water and soil is important not only for the planning of new premises for communities but also for building new industrial plants. The detrimental effects of pollutant gases that are



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# Optimal Patterns Of Location

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## **Optimal Patterns Of Location:**

Optimal Patterns of Location Jan Serck-Hanssen,1970

**Optimal Location of Facilities** Gerard Rushton,1975

**Smart Materials in Structural Health Monitoring, Control and Biomechanics** Chee-Kiong Soh,Yaowen

Yang,Suresh Bhalla,2012-12-03 Smart Materials in Structural Health Monitoring Control and Biomechanics presents the latest developments in structural health monitoring vibration control and biomechanics using smart materials The book mainly focuses on piezoelectric fibre optic and ionic polymer metal composite materials It introduces concepts from the very basics and leads to advanced modelling analytical numerical practical aspects including software hardware issues and case studies spanning civil mechanical and aerospace structures including bridges rocks and underground structures This book is intended for practicing engineers researchers from academic and R D institutions and postgraduate students in the fields of smart materials and structures structural health monitoring vibration control and biomedical engineering Professor Chee Kiong Soh and Associate Professor Yaowen Yang both work at the School of Civil and Environmental Engineering Nanyang Technological University Singapore Dr Suresh Bhalla is an Associate Professor at the Department of Civil Engineering Indian Institute of Technology Delhi India

**Resource Use Efficiency and Optimum Cropping Pattern in Rajasthan** Dr. M. K. Jangid, Dr. (Mrs.) Latika Sharma, Dr. D. C. Pant,2022-01-01 First of all I ordiently pay my obeisance to Maa Saraswati and Lord Hanumana with whose grace and blessings I could accomplish this task It is a matter of pride and honour for me to express my sincere and deep sense of gratitude to my esteemed teacher and major advisor Dr Mrs Latika Sharma Assistant Professor Officer Incharge CCPC Department of Agricultural Economics and Management Rajasthan College of Agriculture Udaipur for stimulative guidance incessant encouragement constructive suggestions painstaking keen and sustained efforts throughout the course of study without which it would not have been possible for me to complete this work

*Technological Developments in Networking, Education and Automation* Khaled Elleithy,Tarek Sobh,Maged Iskander,Vikram Kapila,Mohammad A. Karim,Ausif Mahmood,2010-06-18 Technological Developments in Networking Education and Automation includes a set of rigorously reviewed world class manuscripts addressing and detailing state of the art research projects in the following areas Computer Networks Access Technologies Medium Access Control Network architectures and Equipment Optical Networks and Switching Telecommunication Technology and Ultra Wideband Communications Engineering Education and Online Learning including development of courses and systems for engineering technical and liberal studies programs online laboratories intelligent testing using fuzzy logic taxonomy of e courses and evaluation of online courses Pedagogy including benchmarking group learning active learning teaching of multiple subjects together ontology and knowledge management Instruction Technology including internet textbooks virtual reality labs instructional design virtual models pedagogy oriented markup languages graphic design possibilities open source classroom management software automatic email response systems tablet pcs personalization using web mining technology intelligent

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University of Glasgow Social and Economic Studies ,1968     **Regional Policy in EFTA** EFTA Economic Development Committee,1968     **Economics and Operational Research** Michael Harry Beilby,1975     *The ... IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications* IEEE International Symposium on Personal, Indoor, and Mobile Radio Communications,1995     *Urban and Regional Planning Series* ,1972     **The Theory of the Limiting Utility Applied to the Development of Natural Resources in Arid Lands** Michael Francis Sheehan,1979     Handbook of Biological Confocal Microscopy James Pawley,2006-06-02 Once the second edition was safely off to the printer the 110 larger world of micro CT and micro MRI and the smaller world authors breathed a sigh of relief and relaxed secure in the belief revealed by the scanning and transmission electron microscopes that they would never have to do that again That lasted for 10 To round out the story we even have a chapter on what PowerPoint years When we nally awoke it seemed that a lot had happened does to the results and the annotated bibliography has been In particular people were trying to use the Handbook

as a text updated and extended book even though it lacked the practical chapters needed. There was with the previous editions the editor enjoyed a tremendous had been tremendous progress in lasers and fiber optics and in our amount of good will and cooperation from the 124 authors understanding of the mechanisms underlying photobleaching and involved. Both I and the light microscopy community in general phototoxicity. It was time for a new book. I contacted the usual owe them all a great debt of gratitude. On a more personal note I suspect and almost all agreed as long as the deadline was still a would like to thank Kathy Lyons and her associates at Springer for year away. **Process and Pattern in Economic Geography** Gerald Taylor Bloomfield, University of Guelph. Department of Geography, 1988. **The Spatial Dynamics of a Population of Gasoline Service Stations** R. James Claus, 1969. 1981. **Industrial Location** Michael J. Webber, 1984-07. Webber tackles a fundamental topic the strategy and pattern behind the location of industrial production. He uses examples from the aircraft parts industry the industrial decline in the UK and the location pattern of manufacturing within cities. They suggest that as transport costs have fallen the main location factors have become labour and agglomeration themselves dependent upon general economic political and social systems.

## **Optimal Patterns Of Location** Book Review: Unveiling the Power of Words

In a world driven by information and connectivity, the energy of words has become more evident than ever. They have the capability to inspire, provoke, and ignite change. Such may be the essence of the book **Optimal Patterns Of Location**, a literary masterpiece that delves deep into the significance of words and their impact on our lives. Compiled by a renowned author, this captivating work takes readers on a transformative journey, unraveling the secrets and potential behind every word. In this review, we shall explore the book's key themes, examine its writing style, and analyze its overall effect on readers.

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