Course title: Industrial Development and Sustainability: Policies, Performance, & Practices			
Course code: PPS 158	**No. of credits:** 2	**L-T-P:** 25-05-00	**Learning hours:** 30
Pre-requisite course code and title (if any): None			
Department: Department of Policy & Management Studies			
Course coordinator(s): Dr. Chandan Kumar		**Course instructor(s):** Dr. Anjali Tandon, & Others	
Contact details: chandan.kumar@terisas.ac.in			
Course type: Core		**Course offered in:** 2nd Semester	

Course description

Sustainable industrial development is vital for addressing the complex challenges of the 21st century, including climate change, resource depletion, and social inequities. It aligns with a country's commitment to global responsibilities. By prioritizing sustainability in industrial practices (especially in manufacturing industries), governments and organizations can create resilient economies, foster innovation, protect the environment, and improve the quality of life for current and future generations. In recent times in emerging economies, policymakers have taken a keen interest in the various ways smart industrial policy can help sustain growth and open new possibilities for employment creation. This course offers an in-depth exploration of sustainable industrial development, focusing on industrial ecology, industrial performance, regulatory frameworks, and sustainability practices. It is designed for students to understand the complexities of industrial development in the context of environmental sustainability and social equity.

The course is divided into four modules. The first module introduces major industries, their socioeconomic and environmental impacts, significance of integrating sustainability in industrial practices, and the concept of industrial ecology. The second module provides an overview of India's industrial policy development, assessment of India's industrial performance, and examines the policy challenges that arise from striving for sustainable industrialization, or industrial development in general. The third module provides a discussion about the legal and regulatory frameworks governing industrial practices. It emphasizes the role of governance in promoting sustainability and discusses emerging trends and future prospects for sustainable industrial development. The final module orients to international and Indian cases of successful industrial practices and policy initiatives to promote industrial development with sustainability aspects. Students will explore and discuss diverse case studies to understand the factors that contribute to successful implementation and outcomes.

Learning objectives:

- To help students understand the principles and practices of industrial development and sustainability.
- To orient students to analyze the performance of industries in the context of sustainability and identify key policy challenges.
- To assist students to examine regulatory frameworks and governance mechanisms that promote sustainable industrial practices.
- To capacitate students to discuss and assess case studies to identify the best practices and lessons learned in industrial development.

Course content

Module	Topic	L	T	P
1.	**Introduction to Major Industries, their Impacts, & Sustainability Linkages** • Classification of Industry (based on product type, scale, stage of production, capital investment, ownership, economic function, technology) with basic characteristics • Overview of major industries, their evolution and socioeconomic implications in Indian context • Environmental Implications of Industrial Development: Pollution and Resource Depletion; Ecosystem Services and Biodiversity loss • Idea of a sustainable industrial development- linkages with Sustainable Development Goals • Introduction to Industrial Ecology: Socioeconomic Metabolism; Industrial Symbiosis	6	0	0

2.	**Industrial Policy, Performance & Challenges** • An Overview of India's Industrial Policy: Early Years Post-Independence (1947-1965), Green Revolution and Economic Planning (1965-1980), Liberalization Era (1991-Present), Recent Developments (2000s-Present), Current Challenges • India's Industrial Performance Assessment and Policy Linkages: including Productivity Measures; Efficiency Metrics; Quality Measures; Financial Performance Indicators; Sustainability Metrics; Market Share and Competitive Position; Innovation and Research and Development (R&D); Employment and Labour Metrics; Supply Chain Performance; Regulatory Compliance and Safety Standards Measures & Metrics; Life-Cycle Assessment; Material Flow Analysis. • Global Value Chains (GVCs): Industrial Policy Imperative; Key challenges that GVCs present for Industrial Policy in India • Green Industrial Policy: Advantages of improved environmental quality of products	8	0	0
3.	**Regulatory Frameworks, Governance and Future Prospects for Sustainable Industrial Development** • Environmental Regulations: Emissions Standards; Waste Management Regulations • Resource Efficiency Standards; Circular Economy Incentives • Renewable Energy Standards; Carbon Pricing and Emission Trading Schemes • Sustainability Reporting and Transparency: Mandatory Sustainability Reporting; Corporate Social Responsibility (CSR) • Labour and Social Standards: Labour Rights Regulations; Environmental and Social Impact Assessments (ESIAs) • Public-Private Partnerships (PPPs) for effective governance for Industrial Development • Future Prospects: Technological Innovation; Renewable Energy Integration; Circular Economy Models; Sustainable Supply Chains; Policy and Regulation; Green Jobs and Skills Development	9	0	0
4.	**Cases of Best Practices and Policies in Industrial Development** • International Cases, such as, Kalundborg Industrial Symbiosis, Denmark; Singapore's Industrial Policy; Japan's Kaizen Approach; China's Special Economic Zones (SEZs); Sweden's Focus on Green Technology; Finland's Innovation-Driven Industrial Development; Israel's High-Tech Cluster Development; South Korea's Chaebol Model. • Indian Cases, such as, Make in India Initiative, 2014; National Policy on Electronics (NPE), 2019; Production-Linked Incentive (PLI) Scheme; Start-up India Initiative, 2016; National Industrial Corridor Development Programme (NICDP); Atal Innovation Mission (AIM); Skill India Mission, 2015; National Handloom Development Programme; Tata Group: Sustainable and Diversified Operations; Mahindra & Mahindra: Agro-Tech Innovations; Infosys: Green IT Initiatives.	2	5	0
	Total	**25**	**5**	**0**

Evaluation criteria:

Course grades will be based on the following criteria:

- **Minor Test-1:** Short-Answer Type Questions/Quizzes/MCQs (30%)
- **Minor Test-2:** Group Presentation of Module-4 based Cases (20%)
- **Major Test:** Written Test/Term Paper Submission & Presentation (50%)

Learning outcomes

Upon completion of this course, candidates will be:

1. having a well-rounded understanding of the principles and practices underlying sustainable industrial development (All evaluations)
2. equipped with the tools necessary to critically analyse industrial policies, assess performance, and propose innovative solutions that align with sustainability goals (All evaluations)

Pedagogical approach

Classroom lectures; Student Seminars; Invited talks from Experts in particular domains including Practitioners and Senior/Superannuated Govt. Officers; Case studies.

Suggested Readings

Module 1:

- Clift, R., & Druckman, A. (eds.) (2016). *Taking Stock of Industrial Ecology*. Cham, Switzerland: Springer International Publishing AG.
- Graedel, T. E., & Allenby, B. R. (2003). *Industrial Ecology*, *2nd edition*. Prentice Hall.
- Graedel, T. E., & Eckelman, M. J. (2023). *Industrial Ecology and Sustainability*. Singapore: World Scientific Publishing Co. Pte. Ltd.
- Bianchi, P., Labory, S., & Tomlinson, P. (Eds.). (2023). *Handbook of Industrial Development*. Cheltenham, UK: Edward Elgar Publishing.
- Wallace, D. (1996). *Sustainable Industrialization*. London: Routledge. https://doi.org/10.4324/9781315145372.
- Li, Y. (2015). Towards Inclusive and Sustainable Industrial Development. *Development*, *58*, 446–451. https://doi.org/10.1057/s41301-016-0055-8.
- Schwarzer, J. (2013). *Industrial Policy for a Green Economy*. Manitoba, Canada: The International Institute for Sustainable Development. https://www.iisd.org/system/files/publications/industrial_policy_green_economy.pdf.

Module 2:

- Yülek, M. A. (Ed.) (2018). *Industrial Policy and Sustainable Growth*. Singapore: Springer Nature Singapore Pte Ltd.
- Nanda, N. (2022). *India's Industrial Policy and Performance: Growth, Competition and Competitiveness*. London & New York: Routledge.
- Tandon, A. (2023). *Labour and Capital Use in Indian Manufacturing: Structural Aspects*. London & New York: Routledge.
- Francis, S. (2019). *Industrial Policy Chanllenges for India: Global Value Chains and Free Trade Agreements*. Oxon & New York: Routledge
- Szirmai, A., Naudé, W., & Alcorta, L. (Eds.) (2013). *Pathways to Industrialization in the Twenty-First Century: New Challenges and Emerging Paradigms*. WIDER Studies in Development Economics. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199667857.001.0001.
- Veeramani, C., & Nagaraj, R. (Eds.) (2016). *International Trade and Industrial Development in India: Emerging Trends, Patterns and Issues*. Orient BlackSwan.
- Bhattacharjea, A. (2022). Industrial policy in India since independence. *Indian Economic Review*, *57*, 565–598. https://doi.org/10.1007/s41775-022-00154-9.
- Felipe, J. (2015). *Development and Modern Industrial Policy in Practice: Issues and Country Experiences*. Manila, Philippines: Asian Development Bank. https://www.adb.org/sites/default/files/publication/158170/development-modern-industrial-policy-practice.pdf.
- Ambec, S. (2017). Gaining competitive advantage with green industrial policy, in Altenburg, T., & Assmann, C. (eds), *Green Industrial Policy: Concept, Policies, Country Experiences* (pp. 38-49). Geneva, Bonn: UN Environment; German Development Institute / Deutsches Institut für Entwicklungspolitk (DIE). https://www.ilo.org/sites/default/files/wcmsp5/groups/public/%40ed_emp/documents/publication/wcms_613861.pdf
- Singh, A. (2009). The Past, Present, and Future of Industrial Policy in India: Adapting to the Changing Domestic and International Environment, in Cimoli, M., Dosi, G., & Stiglitz, J. E. (eds), *Industrial Policy and Development: The Political Economy of Capabilities Accumulation*,

Initiative for Policy Dialogue. Oxford: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780199235261.003.0011.

Module 3:

- Singh, P., Bassin, J. P., Rajkhowa, S., Hussain, C. M., & Oraon, R. (Eds.) (2022). *Environmental Sustainability and Industries: Technologies for Solid Waste, Wastewater, and Air Treatment*. Elsevier Ltd.
- El-Haggar, S. M. (2007). *Sustainable Industrial Design and Waste Management: Cradle-to-cradle for Sustainable Development*. Elsevier Ltd.
- Wallace, D. (1995*). Environmental Policy and Industrial Innovation: Strategies in Europe, the USA and Japan*. London: Routledge. https://doi.org/10.4324/9781315145358.
- Kastelli, I., Mamica, L. & Lee, K. (2023). New perspectives and issues in industrial policy for sustainable development: from developmental and entrepreneurial to environmental state. *Review of Evolutionary Political Economy*, *4*, 1–25. https://doi.org/10.1007/s43253-023-00100-2.
- The AIRE Centre, & UNDP Bosnia and Herzegovina (2023). Building a Sustainable Future: ESG Business Handbook, How Environmental, Social and Governance Standards Can Benefit Your Business. https://www.undp.org/sites/g/files/zskgke326/files/2023-08/building_a_sustainable_future_esg_business_handbook.pdf.
- Altenburg, T., & Assmann, C. (Eds.). (2017). *Green Industrial Policy. Concept, Policies, Country Experiences*. Geneva, Bonn: UN Environment; German Development Institute / Deutsches Institut für Entwicklungspolitk (DIE). https://drodrik.scholar.harvard.edu/files/dani-rodrik/files/altenburg_rodrik_green_industrial_policy_webversion.pdf.
- United Nations (2019). *A Framework for Science, Technology and Innovation Policy Reviews: Harnessing innovation for sustainable development*. Geneva: United Nations. https://unctad.org/system/files/official-document/dtlstict2019d4_en.pdf.
- Siekmann, F., Schlör, H. & Venghaus, S. (2023). Linking sustainability and the Fourth Industrial Revolution: a monitoring framework accounting for technological development. *Energy, Sustainability and Society*, *13*, 26. https://doi.org/10.1186/s13705-023-00405-4.
- Ahmad, H., Yaqub, M., & Lee, S. H. (2024). Environmental-, social-, and governance-related factors for business investment and sustainability: a scientometric review of global trends. *Environment, Development and Sustainability*, *26*, 2965–2987. https://doi.org/10.1007/s10668-023-02921-x.
- Cohen, E. (2017). *Sustainability Reporting for SMEs: Competitive Advantage Through Transparency*. Oxon & New York: Routledge.
- Bini, L., & Bellucci, M. (2020). *Integrated Sustainability Reporting: Linking Environmental and Social Information to Value Creation Processes*. Cham, Switzerland: Springer Nature Switzerland AG.
- Wagenhofer, A. (2023). Sustainability Reporting: A Financial Reporting Perspective. *Accounting in Europe*, *21*(1), 1–13. https://doi.org/10.1080/17449480.2023.2218398.
- Rimmel, G., Aras, G., Baboukardos, D., Krasodomska, J., Nielsen, C., & Schiemann, F. (Eds.) (2024). *Research Handbook on Sustainability Reporting*. Cheltenham, UK: Edward Elgar Publishing Ltd.

Module 4:

- Jacobsen, N. B. (2006). Industrial Symbiosis in Kalundborg, Denmark: A Quantitative Assessment of Economic and Environmental Aspects. *Journal of Industrial Ecology*, *10*(1-2), 239-255. https://doi.org/10.1162/108819806775545411.
- Valentine, S. V. (2016). Kalundborg Symbiosis: Fostering progressive innovation in environmental networks. *Journal of Cleaner Production*, *118*, 65-77. https://doi.org/10.1016/j.jclepro.2016.01.061.
- Cheang, B. (2024). What Can Industrial Policy Do? Evidence from Singapore. *The Review of Austrian Economics*, *37*, 1–34. https://doi.org/10.1007/s11138-022-00589-6.
- Berglof, E., & Cable, V. (2018). Back in Business: Industrial Policy for Emerging Economies in the New Globalization. ADB Economics Working Paper Series, No. 537. https://www.adb.org/sites/default/files/publication/401871/ewp-537-industrial-policy-emerging-economies.pdf.
- Pereira, A. A. (2000). State Collaboration with Transnational Corporations: The Case of Singapore's Industrial Programmes (1965–1999). *Competition & Change, 4*(4). https://doi.org/10.1177/102452940000400403.

- Goh, D. A. (2005). Modelling a Systemic Industrial Policy Ecosystem: A Case Analysis of Singapore.
- Medina, J. C., López, N. A. S., Terrón, M. E. P., & Córdoba, J. V. M. V. (2024). Kaizen: Improving Productivity and Reducing Waste in a Manufacturing Company: a Practical Case Study. *International Journal of Professional Business Review*, *9*(1), e04241. https://doi.org/10.26668/businessreview/2024.v9i1.4241.
- Jin, K. (2018). Role of Kaizen in Japan's Overseas Development Cooperation. In: Otsuka, K., Jin, K., & Sonobe, T. (eds) *Applying the Kaizen in Africa*. Cham: Palgrave Macmillan. https://doi.org/10.1007/978-3-319-91400-8_2.
- Sahmi, Z., & El Abbadi, L. (2024). The evolution of Kaizen in the industry: systematic literature review. *International Journal of Production Management and Engineering*, *12*(2), 169–179. https://doi.org/10.4995/ijpme.2024.21143.
- Yuan, Y. (2023). *Studies on China's Special Economic Zones 5*. Singapore: Springer Nature Singapore Pte Ltd.
- Crane, B., Albrecht, C., Duffin, K. M., & Albrecht, C. (2018). China's special economic zones: an analysis of policy to reduce regional disparities. *Regional Studies, Regional Science*, *5*(1), 98–107. https://doi.org/10.1080/21681376.2018.1430612.
- Zeng, D. Z. (2012). China's Special Economic Zones and Industrial Clusters: Success and Challenges. Lincoln Institute of Land Policy Working Paper. https://www.lincolninst.edu/app/uploads/legacy-files/pubfiles/2261_1600_Zeng_WP13DZ1.pdf.
- Sun, M., Song, T., Liu, W., & Cheng, Z. (2022). Rejuvenating SEZs through Internationalization: A Case Study of Chinese Domestic and International SEZs. *Land*, *11*(5), 596. https://doi.org/10.3390/land11050596.
- Wu, M., Liu, C., & Huang, J. (2021). The special economic zones and innovation: Evidence from China. *China Economic Quarterly International*, *1*(4), 319-330. https://doi.org/10.1016/j.ceqi.2021.11.004.
- Karltorp, K., & Maltais, A. (2024). Financing green industrial transitions: A Swedish case study. *Energy and Climate Change*, *5*, 100138. https://doi.org/10.1016/j.egycc.2024.100138.
- Söderholm, K., & Bergquist, A. (2013). Growing Green and Competitive: A Case Study of a Swedish Pulp Mill. *Sustainability*, *5*(5): 1789-1805. https://umu.diva-portal.org/smash/record.jsf?dswid=-9778&pid=diva2%3A618601.
- Wonglimpiyarat, J. (2016). Government policies towards Israel's high-tech powerhouse. *Technovation*, *52-53*, 18-27. https://doi.org/10.1016/j.technovation.2016.02.001.
- Wonglimpiyarat, J. (2015). Case Study of Technology Financing and Commercialization Programs — Israel. In: *Technology Financing and Commercialization*. London: Palgrave Macmillan. https://doi.org/10.1057/9781137470621_8.
- Keunsoo, K. (2013). Chaebols and Their Effect on Economic Growth in South Korea. *Korean Social Sciences Review*, *3*(2), 1-28. https://s-space.snu.ac.kr/bitstream/10371/91035/1/01_Kim%20Keunsoo.pdf.
- Sial, F., & Doucette, J. (2020). Inclusive partners? Internationalising South Korea's *chaebol* through corporate social responsibility-linked development cooperation. *Third World Quarterly*, *41*(10), 1723–1739. https://doi.org/10.1080/01436597.2020.1782185.
- Tripathi, A., & Dastrala, S. M. (2023). Make in India: So Far and Going Ahead. IIMB Working Paper No. 674. https://repository.iimb.ac.in/bitstream/2074/21798/1/WP_IIMB_674.pdf
- Iyer, A. (2018). Moving from Industry 2.0 to Industry 4.0: A case study from India on leapfrogging in smart manufacturing. *Procedia Manufacturing*, *21*, 663-670.
- Anbarasu, S., George, A., Gupta, S., & Gupta, S. (2023). Efficacy of the Make in India Initiative. In: Cheung, P., George, A., & Zhang, X. *Foreign Direct Investments in Emerging Asia: An Evaluation of Pandemic and Policy Shocks*. London: Routledge.
- Anbarasu, S., George, A., Gupta, S., & Gupta, S. (2023). Efficacy of the Make in India Initiative. In: Cheung, P., George, A., & Zhang, X. *Foreign Direct Investments in Emerging Asia: An Evaluation of Pandemic and Policy Shocks*. London: Routledge.
- Nagarjuna, B. (2022). The Impact of Make in India on Foreign Direct Investment: An Analytical Study. *SEDME (Small Enterprises Development, Management & Extension Journal)*. https://doi.org/10.1177/09708464221084181.
- Patel, P., Patil, S., & Vishwanathan, A. (2023). India's Quest for Defence Indigenisation: A Case Study of the Indian Navy. *Journal of Asian Security and International Affairs*. https://doi.org/10.1177/23477970231207255.

- Ramachandran, H. (2019). Review of Industrial and Development Corridors in India. ISID Working Paper 217. https://isid.org.in/wp-content/uploads/2022/07/WP217.pdf.
- Anand, S., & Sami, N. (2016). Scaling Up, Scaling Down: State Rescaling along the Delhi—Mumbai Industrial Corridor. *Economic and Political Weekly*, *51*(17), 50–58. http://www.jstor.org/stable/44003407.
- Chattaraj, S. (2023). Infrastructure, institutions and industrialisation: The Delhi-Mumbai Industrial Corridor and regional development in Gujarat and Uttar Pradesh. ORF Issue Brief. https://www.orfonline.org/research/infrastructure-institutions-and-industrialisation-the-delhi-mumbai-industrial-corridor-and-regional-development-in-gujarat-and-uttar-pradesh
- Bhandari, B., Bandyopadhyay, S., Bhattacharya, T., Choudhuri, P., Das, M., Parashar, A., Prabhakar, J., Rawat, P., & Sahu, A. K. (2021). Skilling India from the Ground up: Project Case Studies. Working Paper No. 167. National Council of Applied Economic Research, New Delhi. https://www.ncaer.org/wp-content/uploads/2022/09/1624770555WP-127.pdf
- Bishnoi, T., & Rai, D. K. (2022). Case Study: India. The Role of the Skill Council for Green Jobs (SCGJ) in Recognising Green Skills and Upskilling Workers in Micro, Small and Medium Enterprises. In: Pavlova, M., & Singh, M. (eds.) Recognizing Green Skills Through Non-formal Learning. Education for Sustainability, vol 5. Singapore: Springer. https://doi.org/10.1007/978-981-19-2072-1_7.

Student responsibilities

- At least 75% attendance will be necessary to be able to appear for the final exam.
- Active classroom participation; Critical reflections and timely submission according to the evaluation criterion.

Course Outline prepared by: Dr. Chandan Kumar

Course reviewers

1. Prof. S. P. Singh, Professor of Economics, Department of Humanities & Social Sciences, Indian Institute of Technology Roorkee (IITR), Roorkee, Uttarakhand, India.
2. Dr. Anjali Tandon, Associate Professor, Institute for Studies in Industrial Development (ISID), New Delhi, India.

Additional Information

This Course outline was approved in the 60th Academic Council Meeting held on 24th December 2024 at TERI School of Advanced Studies, New Delhi.