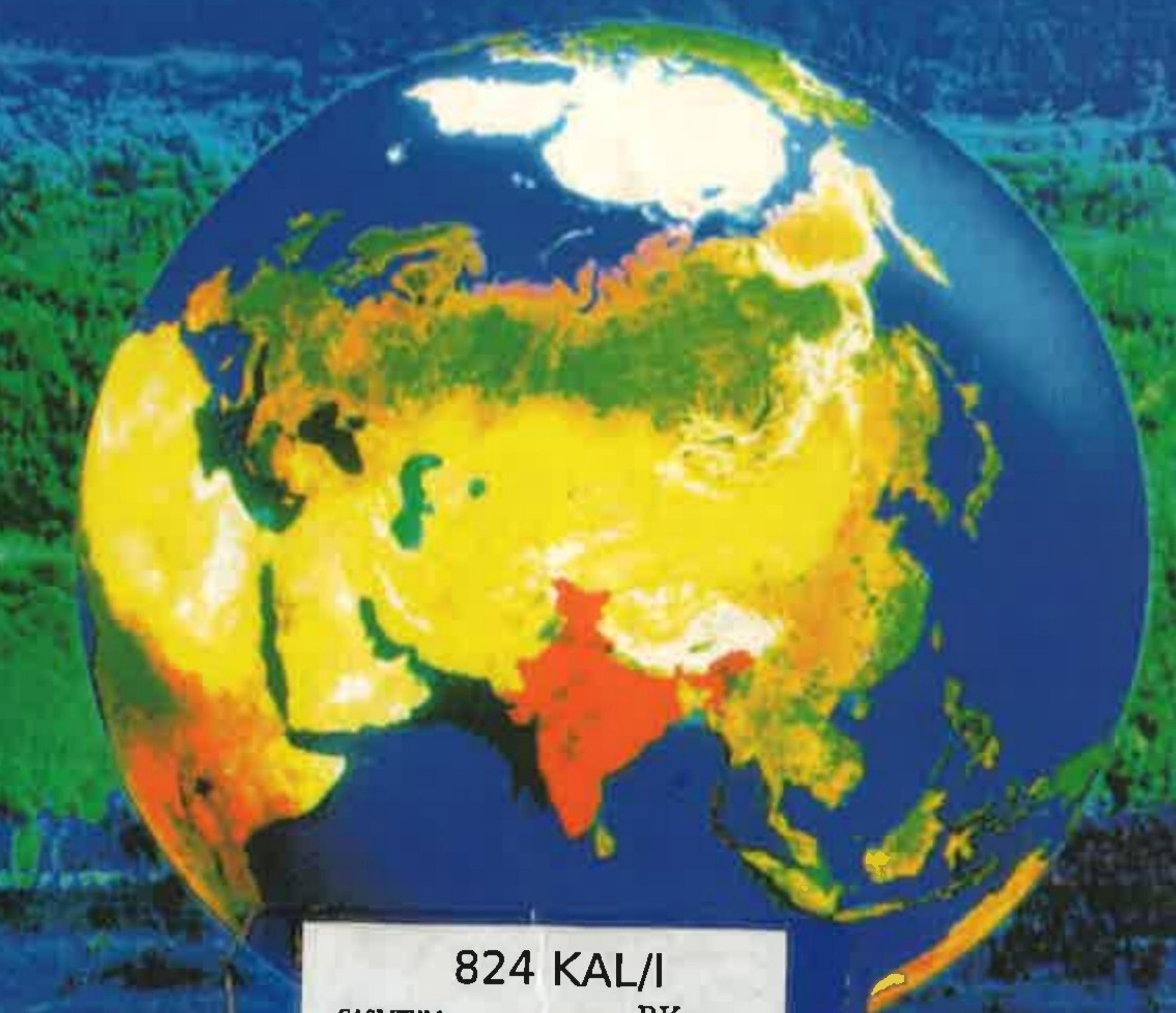




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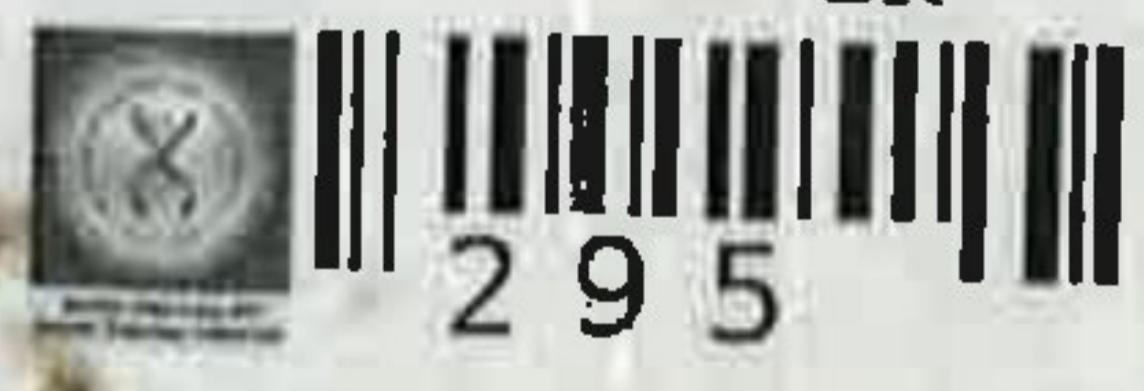
A Vision for the New Millennium



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- Mohan, Dinesh, 'Education and its market value', *Seminar 461*, January, 1998.
- Nagaraj, R., 'What has happened since 1991? Assessment of India's Economic Reforms', *Economic and Political Weekly*, November 8, 1997.
- Revolution in the US Information Infrastructure*, National Academy of Engineering, National Academy Press, Washington, DC, 1995.
- Neogi, Chiranjib and Buddhadeb Ghosh, 'Impact of Liberalization on Performance of Indian Industries, A Firm Level Study', *Economic and Political Weekly*, February 28, 1998.
- Roy, Sumit, 'Globalization, Structural Change and Poverty: Some conceptual and policy issues', *Economic and Political Weekly*, August 16–23, 1997.
- Scientific American*, 'Key technologies for the 21st century', 150th Anniversary Issue, September 1995.
- Scientific American* 'Technological Competitiveness towards 2020', April 1994.
- Siddhartha, V., 'A System-Praxis View of the Political-Economy of Environmental Regulation or is there any way to persuade "them" to listen to "us"', New Delhi.
- Singapore Business*, 'Technopreneurship: They're shooting for the stars', April 1998.
- Singh, Jaswant, 'What Constitutes National Security in a Changing World Order? India's Strategic Thought', CASI Occasional Paper Number 6, June 1998.
- Singh, Rachna & Sandhya Tewari, 'WTO's implications on Indian Agriculture', CII.
- Smadja, Claude, 'Surviving Globalization, Management and Technology', *Manufacturers Digest*, December–January 1998.
- Subramanian, S.K., 'Planning Science and Technology for National Development: The Indian Experience', *Technology Forecasting and Social Change 31*, 87–101 (1987), Elsevier Science Publishing Co., Inc.
- Sundarji, K., 'India 2015: A strategic perspective', *Current Science*, Vol. 68, No. 6, 25 March 1995.
- 'East Asian Economics', *The Economist*, March 7th, 1998.
- 'Second thoughts about globalization', *The Economist*, June 21, 1997.
- TIME Special Issue*, 'The new age of discovery', January, 1998.
- 'Transforming India', *TIME Special Report*, March 25, 1996.
- United States General Accounting Office, 'Asian Aeronautics, Technology Acquisition Drives Industry Development', May 1994.
- William James C., 'The Rise of Silicon Valley', *Invention & Technology*, Spring/Summer 1990.

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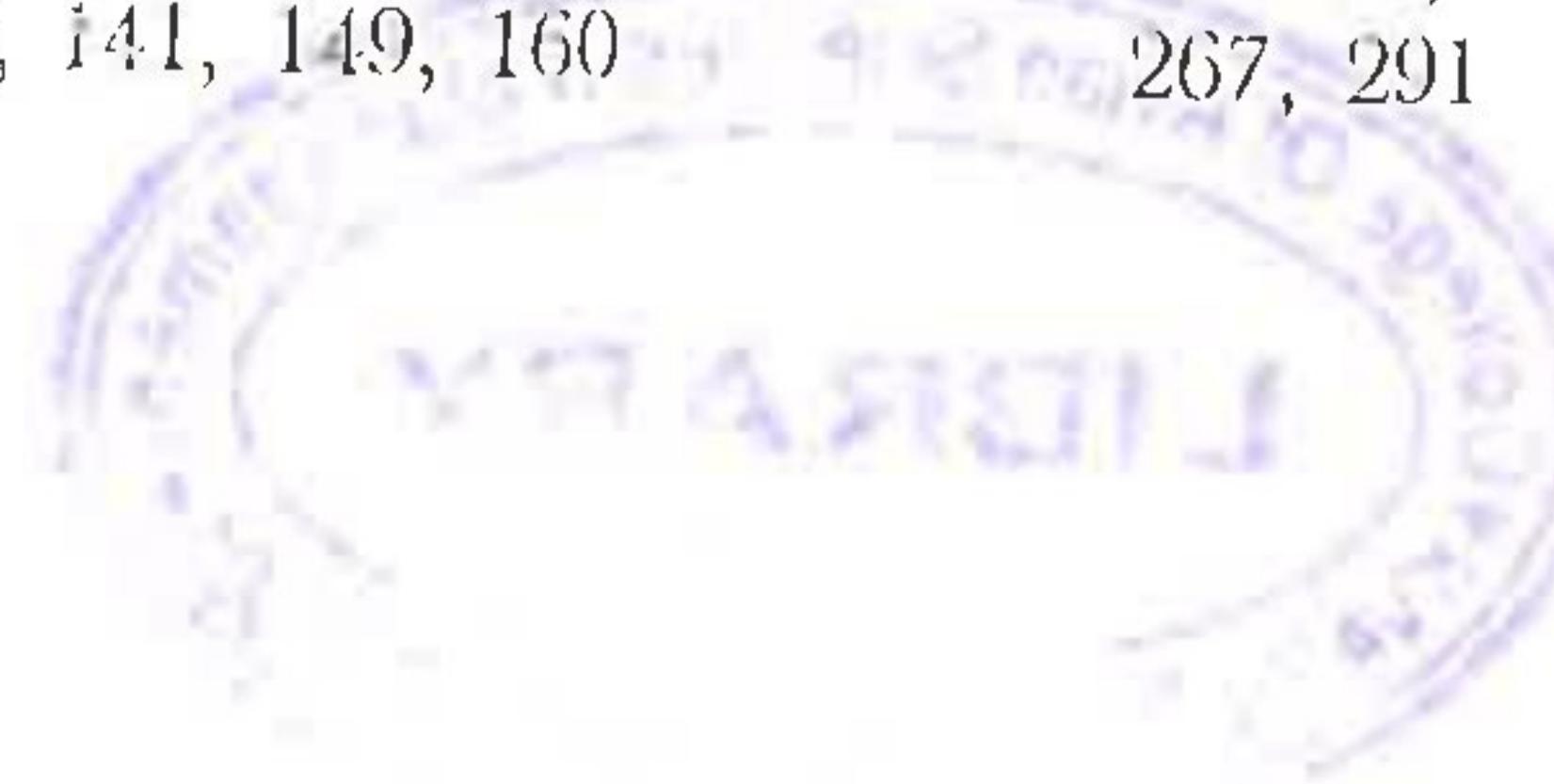
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They cite growth rates and development trends to show that the goal is not an unrealistic one. Past successes, too, bear them out. For example, we were able to launch the green revolution at a time when experts had all but given up on India ever becoming self-sufficient in food. Similarly, in the field of space technology we started from scratch to have today a system of satellite-based communication linking remote regions of the country. The same sense of purpose can lead us to success in many other areas crucial to achieving the goal of a prosperous, strong nation, assert Kalam and Rajan.

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