Robert U Ayres

List of Publications by Year
in descending order

128 papers	7,360 citations	53794 45 h-index	58581 82 g-index
140 all docs	140 docs citations	140 times ranked	4964 citing authors

#	Article	IF	Citations
1	The 1.7 Kilogram Microchip:Â Energy and Material Use in the Production of Semiconductor Devices. Environmental Science & Technology, 2002, 36, 5504-5510.	10.0	326
2	Accounting for growth: the role of physical work. Structural Change and Economic Dynamics, 2005, 16, 181-209.	4.5	292
3	Global Phosphorus Flows and Environmental Impacts from a Consumption Perspective. Journal of Industrial Ecology, 2008, 12, 229-247.	5.5	280
4	Exergy, power and work in the US economy, 1900â€“1998. Energy, 2003, 28, 219-273.	8.8	277
5	Exergy, waste accounting, and life-cycle analysis. Energy, 1998, 23, 355-363.	8.8	229
6	Eco-efficiency, asset recovery and remanufacturing. European Management Journal, 1997, 15, 557-574.	5.1	224
7	Eco-thermodynamics: economics and the second law. Ecological Economics, 1998, 26, 189-209.	5.7	221
8	From LTER to LTSER: Conceptualizing the Socioeconomic Dimension of Long-term Socioecological Research. Ecology and Society, 2006, 11, .	2.3	189
9	Life cycle analysis: A critique. Resources, Conservation and Recycling, 1995, 14, 199-223.	10.8	188
10	The greenhouse effect: Damages, costs and abatement. Environmental and Resource Economics, 1991, 1, 237-270.	3.2	182
11	On the practical limits to substitution. Ecological Economics, 2007, 61, 115-128.	5.7	181
12	Evidence of causality between the quantity and quality of energy consumption and economic growth. Energy, 2010, 35, 1688-1693.	8.8	173
13	Lithium: Sources, Production, Uses, and Recovery Outlook. Jom, 2013, 65, 986-996.	1.9	172
14	Energy efficiency, sustainability and economic growth. Energy, 2007, 32, 634-648.	8.8	171
15	Metals recycling: economic and environmental implications. Resources, Conservation and Recycling, 1997, 21, 145-173.	10.8	170
16	The second law, the fourth law, recycling and limits to growth. Ecological Economics, 1999, 29, 473-483.	5.7	162
17	Sustainability economics: Where do we stand?. Ecological Economics, 2008, 67, 281-310.	5.7	159
18	Strong versus Weak Sustainability. Environmental Ethics, 2001, 23, 155-168.	0.4	154

#	ARTICLE	IF	CITATIONS
19	The underestimated contribution of energy to economic growth. Structural Change and Economic Dynamics, 2013, 27, 79-88.	4.5	139
20	Energy use and economic development: A comparative analysis of useful work supply in Austria, Japan, the United Kingdom and the US during 100years of economic growth. Ecological Economics, 2010, 69, 1904-1917.	5.7	127
21	The impact of remanufacturing in the economy. Ecological Economics, 2000, 32, 413-429.	5.7	119
22	Limits to the growth paradigm. Ecological Economics, 1996, 19, 117-134.	5.7	113
23	On the life cycle metaphor: where ecology and economics diverge. Ecological Economics, 2004, 48, 425-438.	5.7	109
24	Global Phosphorus Flows in the Industrial Economy From a Production Perspective. Journal of Industrial Ecology, 2008, 12, 557-569.	5.5	106
25	The economic growth enigma: Capital, labour and useful energy?. Energy Policy, 2014, 64, 16-28.	8.8	106
26	Material Flow Analysis of Scarce Metals: Sources, Functions, End-Uses and Aspects for Future Supply. Environmental Science & Technology, 2013, 47, 2939-2947.	10.0	105
27	Toxic heavy metals: materials cycle optimization.. Proceedings of the National Academy of Sciences of the United States of America, 1992, 89, 815-820.	7.1	102
28	A theory of economic growth with material/energy resources and dematerialization: Interaction of three growth mechanisms. Ecological Economics, 2005, 55, 96-118.	5.7	99
29	Technological transformations and long waves. Part I. Technological Forecasting and Social Change, 1990, 37, 1-37.	11.6	94
30	Useful work and information as drivers of economic growth. Ecological Economics, 2012, 73, 93-102.	5.7	73
31	Materials and the Global Environment: Waste Mining in the 21st Century. MRS Bulletin, 2001, 26, 477-480.	3.5	71
32	The digital economy: Where do we stand?. Technological Forecasting and Social Change, 2004, 71, 315-339.	11.6	63
33	Material efficiency: rare and critical metals. Philosophical Transactions Series A, Mathematical, Physical, and Engineering Sciences, 2013, 371, 20110563.	3.4	62
34	A Note on the Role of Energy in Production. Ecological Economics, 2019, 157, 40-46.	5.7	62
35	Technological transformations and long waves. Part II. Technological Forecasting and Social Change, 1990, 37, 111-137.	11.6	60
36	The Life Cycle of Copper, Its Co-Products and Byproducts. Eco-efficiency in Industry and Science, 2003, , .	0.1	60

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37	The role of technological change. Journal of Environmental Economics and Management, 1980, 7, 353-371.	4.7	57
38	Decomposition of useful work intensity: The EU (European Union)-15 countries from 1960 to 2009. Energy, 2014, 76, 704-715.	8.8	56
39	On Forecasting Discontinuities. Technological Forecasting and Social Change, 2000, 65, 81-97.	11.6	55
40	Cowboys, cornucopians and long-run sustainability. Ecological Economics, 1993, 8, 189-207.	5.7	52
41	The Life-Cycle of Chlorine, Part I: Chlorine Production and the Chlorine-Mercury Connection. Journal of Industrial Ecology, 1997, 1, 81-94.	5.5	52
42	Economic growth: politically necessary but not environmentally friendly. Ecological Economics, 1995, 15, 97-99.	5.7	49
43	Toward a non-linear dynamics of technological progress. Journal of Economic Behavior and Organization, 1994, 24, 35-69.	2.0	48
44	Barriers and breakthroughs: an â€œexpanding frontiersâ€•model of the technology-industry life cycle. Technovation, 1988, 7, 87-115.	7.8	47
45	The minimum complexity of endogenous growth models: the role of physical resource flows. Energy, 2001, 26, 817-838.	8.8	47
46	REXS: A forecasting model for assessing the impact of natural resource consumption and technological change on economic growth. Structural Change and Economic Dynamics, 2006, 17, 329-378.	4.5	46
47	Accounting for Fluorine: Production, Use, and Loss. Journal of Industrial Ecology, 2008, 11, 85-101.	5.5	46
48	On the efficiency of US electricity usage since 1900. Energy, 2005, 30, 1092-1145.	8.8	43
49	Patterns of Pollution in the Hudson-Raritan Basin. Environment, 1986, 28, 14-43.	1.4	42
50	Evolutionary economics and environmental imperatives. Structural Change and Economic Dynamics, 1991, 2, 255-273.	4.5	42
51	Long term trends in resource exergy consumption and useful work supplies in the UK, 1900 to 2000. Ecological Economics, 2008, 68, 126-140.	5.7	42
52	A model for forecasting the substitution of one technology for another. Technological Forecasting and Social Change, 1975, 7, 57-79.	11.6	39
53	Statistical measures of unsustainability. Ecological Economics, 1996, 16, 239-255.	5.7	39
54	Thermodynamic laws, economic methods and the productive power of energy. Journal of Non-Equilibrium Thermodynamics, 2010, 35, .	4.2	39

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55	Exergy Efficiency in Industry: Where Do We Stand?. Environmental Science & Technology, 2011, 45, 10634-10641.	10.0	38
56	Comments on Georgescu-Roegen. Ecological Economics, 1997, 22, 285-287.	5.7	35
57	The price-value paradox. Ecological Economics, 1998, 25, 17-19.	5.7	35
58	Structure and dynamics of useful work along the agriculture-industry-services transition: Portugal from 1856 to 2009. Structural Change and Economic Dynamics, 2016, 36, 1-21.	4.5	33
59	Technology, progress and economic growth. European Management Journal, 1996, 14, 562-575.	5.1	32
60	Turning point: The end of exponential growth?. Technological Forecasting and Social Change, 2006, 73, 1188-1203.	11.6	32
61	On economic disequilibrium and free lunch. Environmental and Resource Economics, 1994, 4, 435-454.	3.2	31
62	Nitrogen's Role in Industrial Systems. Journal of Industrial Ecology, 2001, 5, 77-103.	5.5	30
63	Economics and the Environment. , 0, , .		30
64	The future of technological forecasting. Technological Forecasting and Social Change, 1989, 36, 49-60.	11.6	28
65	Foresight as a survival characteristic: When (if ever) does the long view pay?. Technological Forecasting and Social Change, 1996, 51, 209-235.	11.6	28
66	An Application of Exergy Accounting to Five Basic Metal Industries. Eco-efficiency in Industry and Science, 2006, , 141-194.	0.1	28
67	REJUVENATING THE LIFE CYCLE CONCEPT. Journal of Business Strategy, 1985, 6, 66-76.	1.6	25
68	Efficiency Dilution: Long-Term Exergy Conversion Trends in Japan. Environmental Science & Technology, 2008, 42, 4964-4970.	10.0	23
69	Experience and the life cycle: Some analytic implications. Technovation, 1992, 12, 465-486.	7.8	22
70	Empirical measures of technological change at the sectoral level. Technological Forecasting and Social Change, 1985, 27, 229-247.	11.6	21
71	Environmental market failures: Are there any local market-based corrective mechanisms for global problems?. Mitigation and Adaptation Strategies for Global Change, 1997, 1, 289-309.	2.1	21
72	Towards a Disequilibrium Theory of Endogenous Economic Growth. Environmental and Resource Economics, 1998, 11, 289-300.	3.2	21

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73	Comparative analysis of phosphorus use within national and local economies in China. Resources, Conservation and Recycling, 2007, 51, 454-474.	10.8	21
74	The Life Cycle of Chlorine, Part II: Conversion Processes and Use in the European Chemical Industry. Journal of Industrial Ecology, 1997, 1, 65-89.	5.5	20
75	Technological Progress. Technological Forecasting and Social Change, 1998, 59, 213-233.	11.6	20
76	Technology: The wealth of nations. Technological Forecasting and Social Change, 1988, 33, 189-201.	11.6	19
77	Explicit technological substitution forecasts in long-range input-output models. Technological Forecasting and Social Change, 1976, 9, 113-138.	11.6	17
78	Limits and possibilities of large-scale long-range societal models. Technological Forecasting and Social Change, 1984, 25, 297-308.	11.6	17
79	Bhopal. Technology in Society, 1987, 9, 19-45.	9.4	16
80	The economic growth enigma revisited: The EU-15 since the 1970s. Energy Policy, 2015, 86, 812-832.	8.8	16
81	Industrial metabolism: work in progress. Economy & Environment, 1998, , 195-228.	0.3	13
82	A Schumpeterian model of technological substitution. Technological Forecasting and Social Change, 1985, 27, 375-383.	11.6	12
83	The Life-Cycle of Chlorine, Part IV. Journal of Industrial Ecology, 1999, 3, 121-159.	5.5	11
84	Robotic Realities: Near-Term Prospects and Problems. Annals of the American Academy of Political and Social Science, 1983, 470, 28-55.	1.6	10
85	Optimal investment policies with exhaustible resources: An information-based model. Journal of Environmental Economics and Management, 1988, 15, 439-461.	4.7	10
86	Integrated assessment of the grand nutrient cycles. Environmental Modeling and Assessment, 1997, 2, 107-128.	2.2	10
87	The man-machine interface. Technological Forecasting and Social Change, 1986, 29, 99-118.	11.6	9
88	Energy Efficiency and Economic Growth: the â€˜Rebound Effectâ€™ as a Driver. , 2009, , 119-135.		9
89	Sustainability transition and economic growth enigma: Money or energy?. Environmental Innovation and Societal Transitions, 2013, 9, 8-12.	5.5	9
90	Robotics, CAM, and industrial productivity. National Productivity Review, 1981, 1, 42-60.	0.1	8

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91	Robotics and conservation of human resources. Technology in Society, 1982, 4, 181-197.	9.4	8
92	The Kuznets curve and the life cycle analogy. Structural Change and Economic Dynamics, 1997, 8, 413-426.	4.5	8
93	Social technology and economic development. Technological Forecasting and Social Change, 1985, 28, 141-157.	11.6	6
94	Wealth accumulation and economic progress. Journal of Evolutionary Economics, 1996, 6, 347-359.	1.7	6
95	Response to Comment on â€œThe 1.7 Kilogram Microchip:Â Energy and Material Use in the Production of Semiconductor Devicesâ€ Environmental Science & Technology, 2004, 38, 1916-1917.	10.0	6
96	Unconvinced about a 5th K-wave: A response to Devezas et al.. Technological Forecasting and Social Change, 2005, 72, 936-937.	11.6	6
97	Recycling Rare Metals. , 2014, , 27-38.		6
98	Tax Strategies for Industrial Pollution Abatement. IEEE Transactions on Systems, Man, and Cybernetics, 1973, SMC-3, 588-603.	0.9	5
99	Utility maximization and catasphore aversion: A simulation test. Journal of Environmental Economics and Management, 1987, 14, 337-370.	4.7	5
100	Competition and complementarity in diffusion. Technological Forecasting and Social Change, 1991, 39, 145-158.	11.6	5
101	The Life Cycle of Chlorine, Part III.. Journal of Industrial Ecology, 1998, 2, 93-115.	5.5	5
102	Energy Myth Eight â€" Worldwide Power Systems are Economically and Environmentally Optimal. , 2007, , 201-237.		5
103	Economic Growth and Development: Towards a Catchup Model. Environmental and Resource Economics, 2008, 40, 1-36.	3.2	5
104	Nonlinear Stabilizers of Economic Growth under Exhausting Energy Resources*. IFAC Postprint Volumes IPPV / International Federation of Automatic Control, 2009, 42, 251-256.	0.4	5
105	Improving the scientific basis of public and private decision-making. Technological Forecasting and Social Change, 1984, 26, 195-199.	11.6	4
106	Catastrophe avoidance and risk aversion: Implications of formal utility maximization. Theory and Decision, 1986, 20, 63-78.	1.0	4
107	Technology and information: chain reactions and sustainable economic growth. Technovation, 1990, 10, 163-183.	7.8	4
108	Thermodynamics and Economics, Overview. , 2004, , 91-97.		4

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109	Growth, risk and technological choice. Technology in Society, 1980, 2, 413-431.	9.4	3
110	The role of machine sensing in CIM. Robotics and Computer-Integrated Manufacturing, 1989, 5, 53-71.	9.9	3
111	Time preference and the life cycle: The logic of long-term high risk vs. short-term low risk. European Journal of Operational Research, 1989, 38, 329-349.	5.7	3
112	A proposal for emission calculations for chemical processes, Part I. Resources, Conservation and Recycling, 2006, 48, 280-299.	10.8	3
113	Boosting resource productivity: Creating ping-pong dynamics between resource productivity and resource prices. Environmental Innovation and Societal Transitions, 2013, 9, 48-55.	5.5	3
114	On the Creation and Destruction of National Wealth: Are Financial Collapses Endogenous?. Sustainability, 2021, 13, 7352.	3.2	3
115	Materials Balance Models. , 2011, , 403-422.		3
116	Technological protection and piracy: Some implications for policy. Technological Forecasting and Social Change, 1986, 30, 5-18.	11.6	2
117	Peer Reviewed: Toward a Nonpolluting Energy System. Environmental Science & Technology, 1998, 32, 408A-410A.	10.0	2
118	Economic assumptions in need of renovation. Technological Forecasting and Social Change, 1999, 62, 115-117.	11.6	2
119	The Underestimated Contribution of Energy to Economic Growth. SSRN Electronic Journal, 0, , .	0.4	2
120	Individual versus mass transportation: feasibility of substitution. Transportation Planning and Technology, 1972, 1, 107-113.	2.0	1
121	Social and Economic Implications of Low Emission Vehicles. , 1972, , .		1
122	Exergy: Reference States and Balance Conditions. , 2004, , 633-640.		1
123	Gaps in Mainstream Economics: Energy, Growth, and Sustainability. Studies in Ecological Economics, 2017, , 39-53.	0.2	1
124	Rationale for a physical account of economic activities. Environment & Policy, 1998, , 1-20.	0.4	1
125	Wealth accumulation and economic progress. Journal of Evolutionary Economics, 1996, 6, 347-359.	1.7	1
126	On the sustenance of technological innovation. Technological Forecasting and Social Change, 1971, 3, 273-278.	11.6	0

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127	Economic Impact of Mass Production of Alternative Low Emission Automotive Power Systems. Journal of the Air Pollution Control Association, 1974, 24, 216-224.	0.5	0
128	The Barrier-Breakthrough Model of Innovation and the Life Cycle Model of Industrial Evolution as Applied to the U.S. Electrical Industry. , 1989, , 115-132.		0