

## CURRICULUM VITAE

**PRESENT POSITION:** Senior Adviser  
Hydrology Department, Norwegian water resources and energy administration

**NAME:** Arne Tollan

**DATE OF BIRTH/  
NATIONALITY:** 19 June 1938  
Norwegian

**CIVIL STATUS:** Married

**EDUCATION:** Cand.real. 1962, University of Oslo

**OTHER TRAINING:** Norwegian research council on science and technol. (NTNF)  
Project management seminar, 1976-1977  
UN Proficiency exam in English, 1983  
UN Examen d'aptitude en Francais, 1984  
Norwegian national academy of defence, 1990-1991

**LANGUAGES:** Norwegian (mother tongue); English, fluent;  
French, fluent; German, fair

**COUNTRIES WORKED IN:** Sweden 1964-1965; Switzerland 1970, 1983-1985; Burma/Myanmar 1989; Belgium 1992-1993; Angola 1993; Palestinian territory 1995; Slovenia 1996; Armenia 1998; Bhutan 2001-2002; Serbia and Montenegro 2004-2006.

**PROFESSIONAL SOCIETIES:** Norwegian Geophysical Society, president 1991-1992  
Norwegian Hydrological Council, chairman 1995-2000  
Nordic Hydrological Association, member  
Oslo Geophysicists Association, Chairman 1972-1973, Honorary member 2000- , Member of Election Committee, 2005-  
International Centre for Hydropower, Board of Directors/vice chairman 1999-2005  
Norwegian Water Association, Board of Directors 2002-2005, Member of Election Committee 2005 - , Member of Editorial Board 2006 - .  
The International Water Academy, elected member, 2003-lifetime.  
Board of Directors 2003-2005

**PUBLICATIONS:** **Vannressurser** (Water resources), Universitetsforlaget/Scandinavian University Press, 227 p., Oslo, 2002  
**Samordnad insamling av miljöödata** (Co-ordinated environmental data collection), Swedish Governmental Report (SOU) 125:24, 169p., Stockholm, 1994  
**Vann - en naturressurs** (Water - a natural resource), Oslo University Press, 107 p., Oslo, 1977

Editor, co-editor and contributor to several textbooks and

conference proceedings in the fields of hydrology and environmental science  
70 papers in scientific journals on topics within hydrology, water resources management, air pollution, and environment.

**KEY QUALIFICATIONS:** Scientific background in geosciences. Work experience in management of major research programmes (hydrology, water and soil acidification, national water quality monitoring). Twelve years of directorship of national hydrological service. International experience both in intergovernmental organizations: World Meteorological Organization, UN Economic Commission for Europe, and the European Environment Agency; as well as development projects in Asia and Africa.

**EMPLOYMENT RECORD:**

1998- Senior Adviser, Hydrology department, Norwegian water resources and energy directorate (NVE), P.O.Box 5091 Majorstua, N-0301 Oslo, Norway

1986-1998 Director, Hydrology department, NVE  
Directing the work of the Hydrology Department, which is the national central institution for operational hydrology. The department has 80 staff members (natural sciences, informatics, civil engineers, technical and administrative sectors), and includes sections on hydrometry, environmental hydrology, water balance, glaciology and snow, and data processing. Major tasks were the development of a modern national flood forecasting service, a national water information system, and research on climate change effects on water resources, in particular on hydropower production.

(Leave of absence 1992-1993, see below)

1992-1993 National expert  
European Environment Agency Task Force (EEA), Commission of the European Communities, Brussels, Belgium  
One year assignment for the Norwegian Ministry of Environment. Participation in the preparation of "Europe's Environment 1993", a pan-European status report, commissioned by the European Ministers of environment, Dobris meeting 1991.

1980-1986 Deputy director (1982-1986) and Research manager (1980-1982) Norwegian institute for water research (NIVA), Oslo, Norway  
Special responsibility for external research programmes within the competence of the institute: water chemistry and biology, environmental technology. Co-ordinator of the aquatic part of Norway's national environmental monitoring programme (1980-86), secretary of Board of institute (1982-86). NIVA had 170 scientists and administrative staff at the time.

(Leave of absence 1983-1985, see below)

- 1983-1985 Chief, Air pollution unit,  
UN Economic Commission for Europe (ECE), Geneva, Switzerland
- Overall management and administration of implementation activities for the Convention on Long-range Transboundary Air Pollution, as well as other air pollution activities within ECE. Representing ECE secretariat at international meetings on air pollution. Particular responsibility for negotiations which led to the signing of the Protocol on the reduction of sulphur emissions and their transboundary fluxes by at least 30%, Helsinki 1985.
- 1976-1980 Deputy director  
Joint Norwegian research programme "Acid precipitation - effects on forest and fish" (SNSF Project). Formal employer: Norwegian council for scientific and industrial research, NTNF; (now: Norwegian research council), Oslo, Norway
- Co-ordination of programme planning and budgeting. Editor of programme publications. Delegate to ECE and OECD meetings in the field of air and water pollution. Moderator at Intl. conf. on ecological impact of acid precipitation, Sandefjord, Norway, 1980, and co-editor of conference proceedings.
- 1975-1976 Senior executive officer  
Norwegian research council for science and the humanities, NAVF; (now: Norwegian research council), Oslo, Norway
- Secretary of Scandinavian publishing board in science. Adviser to NAVF on scientific publishing
- 1966-1975 Executive secretary  
Norwegian national committee for the International Hydrological Decade, IHD, Oslo, Norway
- Co-ordination of activities within the IHD programme; an international research programme 1965-1974, under UNESCO auspices. Delegate to IHD Co-ordinating Council (UNESCO), and member of its working group on information and publication. Research on water balance, flood studies, snow hydrology, and urban hydrology.
- 1963-1966 State hydrologist  
Hydrology department, Norwegian water resources and electricity board (NVE), Oslo, Norway
- Regional responsibility for surface water hydrology, network operation and data processing.

## OTHER RELEVANT INFORMATION

Participant and contributor in numerous symposia and conferences in the fields of air and water resources, hydrology, pollution problems, and environmental policy matters; i.a. in Angola, Canada, China, (former) Czechoslovakia, Estonia, Finland, France, Germany, Iceland, India, Italy, Philippines, South Africa, Sweden, Switzerland, UK, USA, and (former) USSR

Reviewer of scientific papers for the journals *Hydrological Sciences Journal*, *Nordic Hydrology* and others.

Regular lecturing at

- *Norwegian University of Life Sciences*, Advanced course: Hydrotechnics, since 1999
- *University of Bergen*, Master of Water Studies, since 2003
- *Oslo University College*, Centre for Multicultural and International Studies, Bachelor level course: Water and Development, since 2005.

Invited lectures from time to time at *University of Oslo* and *International Centre for Hydropower (Trondheim)*

One year fellowship, 1964-1965, at the Swedish Meteorological and Hydrological Institute, SMHI, Stockholm, Sweden  
Consultant to the World Meteorological Organization, WMO, Geneva, Switzerland, 1970 (2 months)

Chairman of Organizing committee for WMO/UNESCO/IAHS Intl. symposium on distribution of precipitation in mountainous areas, Geilo, Norway, 1972

Chairman, Commission of the European Communities Working group on effects of air pollution on aquatic eco-systems, COST 612, 1985-1987

Hydrological adviser to the permanent representative of Norway to WMO; head of delegation to WMO Commission for hydrology (Since 1986); member of WMO Region VI (Europe) Working group on hydrology (Since 1986)

Member of evaluation team for UNDP/WMO Project 84/008, Flood forecasting system, Burma (Myanmar), 1989

Chairman, UN ECE Seminar on ecosystems approach to water management, Oslo, Norway, 1991

Special adviser to the Government of Angola, State secretariat of energy and water affairs, in preparation of a seminar on National water sector management (NAWASMA), 1993-1994

Special adviser to the Government of Sweden, Ministry of communication, on co-ordinated environmental data collection, 1993-1994. Author of Swedish Governmental Report (SOU) 125:24, "Samordnad insamling av miljödata" (Co-ordinated environmental data collection)

Special adviser on behalf of NVE to the Palestinian authorities on establishing a Palestinian Water Authority, 1995 - 2000.

Member of evaluation team, UNEP GRID-Arendal, 1995

Adviser to the Hydrometeorological Institute of Slovenia, Ljubljana. Special Service Agreement with WMO, 1996

Member of Working group on dams and floods, International Commission on Large Dams, ICOLD, 1996-2000

Adviser to the Department of Hydrometeorology of the Republic of Armenia. Special Service Agreement with WMO, 1998.

Member of Water Commission of World Humanity Action Trust (WHAT), London, 1998-2000

Water resources adviser to the Government of Bhutan, 2001 – 2002.

Adviser to the national hydrometeorological services of Montenegro (2004-2005) and Serbia (2006).

Member of Project group on characterising of water bodies, Implementation of EU Water Framework Directive, November 2002 -

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Honorary Member of the Oslo Geophysicists' Association, 2000.

Awarded the national Water Prize 2000 (Norwegian Water Association)

Awarded the national prize "Water Knowledge" (Viten om vann), 2003 (Norwegian Hydrological Council)

Invited member of The International Water Academy (Chair nr. 200), and member of the Board, 2003 - 2005.

**Bold types:** Publications written in English

**Articles and edited reports**

- 1964 Movement and melting of the quaternary inland ice, Northern Gudbrandsdalen mountains (in Norw. Geol. Survey 223:328-345
- Long-term runoff variations in some Norwegian rivers (in Norw.) Norsk geogr. tidsskr. 19:77-90
- Extreme floods, and statistical analysis of different flood types (in Norw.). 4th Nordic Hydrol. Conf., Reykjavik
- 1967 Water balance in the Nordic countries (in Norw.) 5th Nordic Hydrol. Conf., Helsinki
- When the water rises; Floods and flood warnings (in Norw.). Elektroteknisk tidsskrift 32, 6p.
- 1968 Den internasjonale hydrologiske dekade (in Norw.: The International Hydrological Decade) Teknisk ukeblad 29, 6p.
- **(ed.) Hydrological bibliography, Norway 1961-1965, IASH . NVE, Oslo, 37p.**
- 1969 Den internasjonale hydrologiske dekade (in Norw.: The International Hydrological Decade). Norsk geogr. tidsskr. 23:3, p.157-164
- 1970 (ed.) Construction and operation of recording water level stations (in Norw.), NVE Hydrol. Dept. report 1/70, 38p.
- **Experiences with snow pillows in Norway. Bulletin Intl. Assoc. Scient. Hydrol.15,2:113-120**
- **Determinations of areal values of the water equivalent of snow in a representative basin. Nordic Hydrol. Conf. 1970, vol. 2, Stockholm, p. 97-107**
- **Preparation of maps of precipitation and evaporation with special regard to water balances. World Meteorological Organization, Geneva, 19p.**
- 1971 **Regional co-operation in hydrology. Vannet i Norden, 1971,4. Also published as Information document IHD, UNESCO, (1972), and elaborated under the title: The Nordic IHD Council, EOS, Trans. Am. Geophys. Union 53,4:311-312 (1971)**
- 1972 (ed.) Hydrological activities in Norway (in Norw.). The Norwegian IHD Committee, Report 3, 49p.
- The impact of IHD on hydrological research in Norway (in Norw.). Vann 2:139-145
- **Variability of seasonal and annual runoff in Norway. Nordic Hydrology 3:72-79**
- 1974 Hydrological research in Norway (in Norw.). In: Norsk geofysisk forskning 1949-1974, Oslo Geophysical Association, Oslo

- 1974 **Impact of IHD in Norden. Nordic IHD Report 6, 46p**
- A. Tollan and B. Wingård: Last digit frequency of water stage readings (in Norw.). *Vannet i Norden* 4:6-11
- 1975 Hydrological regions in the Nordic countries (in Norw.). *Vannet i Norden* 1:3-16
- S. Furmyr and A. Tollan: Results and experiences of snow investigations, Filefjell Repres. Basin 1967-1974 (in Norw.). The Norw. IHD Committee, Offset report outside series, 32p.
- Urban runoff (in Norw.). *Vann* 4:291-296
- 1976 **River runoff in Norway. In: Fresh water on the sea, eds.: S. Skreslet et al., Assoc. Norweg. Oceanogr., Oslo, p. 11-13**
- The research project «Acid precipitation - effects on forest and fish» (in Norw.). *Vannet i Norden* 4:59-68
- 1977 **Deterioration of water quality due to long range transport of air pollution (acid precipitation etc.) In co-operation with B. Hägerhäll. Norwegian-Swedish thematic report to UN Water Conference, Plata del Mar, March 1977, SFT, Oslo, 13p.**
- (ed.) Acid precipitation and some alternative sources for aquatic acidification (in Norw.). SNSF Project, Oslo-Ås, 168p.
- 1978 **H.M.Seip and A.Tollan: Acid precipitation and other possible sources for acidification of rivers and lakes. The Science of the Total Environment 10:253-270**
- 1979 **L.Gottschalk, J.Lundager Jensen, D.Lundquist, R.Solantie and A.Tollan: Hydrological regions in the Nordic countries. Nordic Hydrology 10:273-286**
- 1980 Monitoring of acid precipitation and its effects in Norway in the 1980s (in Norw.). *Nordic Hydrol. Confer. 1980, Vemdalen. Uppsala Univ., Naturgeogr. Institut. Rep. 53,1:563-575*
- **Effects of acid precipitation on aquatic and terrestrial ecosystems. In: Restoration of lakes and inland waters, Proc. OECD/EPA Intl. Symp., Portland, Maine 1980, p.438-445, US Environ. Protect. Agency, Wash.**
- **D.Drabløs and A.Tollan, eds.: Ecological impact of acid precipitation. Proc. of an intl. conf., Sandefjord, Norway, March 11-14, 1980 SNSF Project, Oslo-Ås, 383p**
- **L.N.Overrein, H.M.Seip and A.Tollan: Acid precipitation - effects on forest and fish. Final report of the SNSF Project 1972-1980. SNSF Project, Oslo-Ås, 176p**
- 1981 **Annotated Bibliography 1974-1980, SNSF Project Acid precipitation - effects on forest and fish. SNSF Project, Oslo-Ås, 42p**
- Water acidification (in Norw.). In: *Hydrologi, Markanvändning, Vattenkalitet* (eds.: M.Falkenmark and I.Johansson) Naturvårdsverket, Sweden, PM 1455:59-68

- 1981 Monitoring (in Norw.) (Environmental monitoring of Norwegian water resources). Norw. Inst. for Water Res. 1980:31-35, NIVA, Oslo
- Presentation of environmental monitoring results (in Norw.), Vann 16:1
- A.Tollan and A.Henriksen: Acid precipitation effects on lakes and rivers (in Norw.). Commemorative publ. to K.Baalsrud, NIVA p. 53-56
- A.Tollan og H.M.Seip: SNSF-prosjektet avsluttet: Økologiske virkningher dokumentert (in Norw.: The SNSF Project finalized; Ecological effects documented). Teknikk og Miljø 4:4-8
- **Effects of acid precipitation on inland waters, GeoJournal 5,5:409-416**
- 1985 **H.M.Seip and A.Tollan: Acid deposition. In: Facets of Hydrology, vol.II, p.69-98, (ed. J.C.Rodda). John Wiley & Sons Ltd.**
- **The Convention on Long-range Transboundary Air Pollution, Journal of World Trade Law 19,6:615-621**
- 1988 Important problems within urban hydrology in Norway (in Norw.), Vann 23:1
- 1990 Nyere utvikling innen "kald hydrologi" i Norge (in Norw.: Recent development within cryology in Norway). Vatnid og Landid, p.45-48, Orkustofnun, Reykjavik
- 1992 **The ecosystem approach to water management. World Meteorological Organization Bulletin 41,1:28-34**  
**Also elaborated under the same title in Nordic Hydrol. Conf. 1992, Alta, Norway. Nordic Hydrol. Programme Report 30:420-430**
- Hva vil skje på vannsiden på Brasil-konferansen i 1992? (in Norw.: What will the UNCED Conference contribute to the water sector). Vann 2:260-263
- 1993 **Future directions for operational hydrology. Proceedings UNESCO-WMO-ICSU International Conference on Hydrology, Towards the 21<sup>st</sup> century, Paris, 22-26 March 1993, UNESCO, p. 90-102**
- 1995 **Water policy. National meeting on water sector management, Luanda, Angola, Oct. 25-27, 1994. Secretaria de Estado da Energia e Águas / Norwegian Water Resources and Energy Administration. p. 49-55**
- **The need for water resources assessment. Water and Energy (Special edition of NVE's bulletin Vann og Energi, ICOLD Annual meeting, Oslo, July 6, 1995)**
- A. Tollan and T. Ljøgodt: The HYDRA research programme - against extreme floods (in Norw.), Vann & Energi, NVE, 2-1995
- Flommen 1995, forutsetninger og varsling (in Norw.: The 1995 flood, causes and forecasting), Vann 3B-1995, p. 447-459
- Vesleofsen (in Norw.: The spring flood 1995, SE Norway), Vær og klima, 1995-4, p. 128-137



- 1996 The HYDRA research programme (in Norw.), Vann 2-1996, p. 288-290
- **Nils Roar Sælthun and Arne Tollan: Hydrological extremes in Norway. Characteristics and management. Country paper, Norway, EurAqua Rome, October 23-25, 1996**
- **Norwegian hydrology after 100 years. WMO Bulletin, Vol 45-2, April 1996, p.167-169**
- 1997 Har jordkloden nok vann til alle? (in Norw.: Has the globe enough water for everybody?) Kronikk, "Aftenposten", 21 Mars 1997
- 1998 De 10 bud for helhetlig vannforvaltning (in Norw.: The 10 commandments for holistic water management), Vann 1-1998, p. 101-104.
- **Improving hydrological data collection and analysis in Norway. p 119-122 in Proceedings "Water – a looming crisis?", IHP Techn. Doc.s in Hydrology 18, UNESCO, June 1998.**
- **European water policies from a Northern European perspective. Invited lecture, XX Nordic Hydrological Conference, Helsinki, Finland, 10-13 August 1998, (unpublished)**
- 1999 NVEs historie og rolle i forvaltningen (in Norw.: History and management role of the Norwegian Water Resources and Energy Directorate), Vann og Energi, 6-1999
- Ikke-konvensjonelle vannressurser (in Norw.: Non-conventional water resources) NVE Hydrologisk månedsrapport, juni 1999, p. 37-39
- 2000 **A. Tollan and J. Kindler: Non-conventional water resources. p. 624-637 in XXI Nordic Hydrological Conference, Uppsala, Sweden. Swedish Hydrological Council, NHP Report 46**
- Vanlige misforståelser i hydrologien (in Norw.: Common misconceptions in hydrology) Vann 3-2000, p. 253-258
- 2001 10-årsflom og 10-årsflom, fru Blom (in Norw.: 10-year floods), Vann 1-2001, p. 16-18. Also in NVE Hydrologisk månedsrapport, Dec. 2000
- Vannressurser i et økonomisk perspektiv (in Norw.: Water resources in an economic perspective), Vann 4-2001, p. 299-307
- 2002 **Land use change and floods: What do we need most, research or management? Water Science and Technology, vol 45:8, p. 183-190**
- **A. Tollan and K. Repp: Hydrological development aid; Factors of success or failure. Proc. XXII Nordic Hydrol. Conf., Nordic Hydrological Programme NHP Report no. 47, vol.I, p.81-88**
- A. Tollan og K. Repp: Hvorfor lykkes eller mislykkes hydrologisk bistand? (in Norw.: Why hydrological aid succeeds or fails). NVE Hydrologisk månedsrapport, oktober 2002, s. 44-48
- 2003 **Planning and management of national hydrological services (discussion paper) WMO Expert meeting on the management of national hydrological services, Centurion, South Africa, 20-24 August 2002 (In: World Meteorological Organization, 2003: CD-Rom Final report, Experts meeting)**
- 2004 **A. Tollan, S. Harsten, L.E.Pettersson and L. Roald: Revising a national hydrological network - the case of Norway. WMO Bulletin, Vol. 53 no. 1, p. 45-49**
- (ed.): Prioritering av stasjonsnett (in Norw.: Prioritising hydrological station networks). NVE Rapport 9 2004. 46 p.

- **Reality or fiction? A critical look at some commonly held concepts about hydrology. XXIII Nordic Hydrological Conference, Tallinn, Estonia. NHP Report No.48, vol. 1, p. 13-20**
- Vann-tro (in Norw.: Water beliefs). Vann 4-2004, p. 279-288

**Books, single author**

- 1977 Vann - en naturressurs. (Water - a natural resource, in Norwegian). Universitetsforlaget / Scandinavian University Books, Oslo, 107p.
- 1994 Samordnad insamling av miljöödata. (Co-ordinated environmental data collection. In Swedish). Governmental public reports, Ministry of Communications, Stockholm, Sweden, SOU 1994:125, 169 p.
- 2002 Vannressurser (Water resources, in Norwegian). Universitetsforlaget, Oslo, 230 p.

**Books, co-author, contributor**

- 1965 STUDIA, Fysisk geografi (in Norw.: Chapter on physical geography), Aschehoug, Oslo
- 1977 Norges geografi, (ed. J.Gjessing) (in Norw.: Geography of Norway, Chapter on hydrology and glaciology, with R. Pytte Asvall), Universitetsforlaget, Oslo
- 1978 Hydrologi i praksis, (eds. J.Otnes and E.Ræstad) (in Norw.: Practical hydrology, Several chapters), Ingeniørforlaget, Oslo, 1. ed. 1971, 2. ed. 1978
- 1993 Kompendium i hydrologi til Gf 141. (in Norw.: Compendium in hydrology) Chapter on regional hydrology of the Nordic countries, Oslo University, Inst. for Geophysics
- 1995 Europe's Environment (ed.: D. Stanners and P. Bourdeau), European Environment Agency, Copenhagen, Contributor to several chapters**
- Tiden går - vannet består. Hydrologisk avdeling gjennom 100 år, 1895-1995, (ed.: Ø. Aars og G. Østrem). (in Norw.: NVE Hydrology Dept. 100 years. Chapters on International relations, p 119-135, and Future aspects, p 164-169). NVE, Oslo
- 1996 Store norske leksikon, (in Norw.) Several encyclopaedia articles on floods and groundwater. Kunnskapsforlaget, Oslo (1996-1998). New edition (2005-)
- 1999 Fra jordas indre til atmosfærens ytre. Oslo Geofysikeres Forening 50 år.(in Norw.: From the interior of the Earth to the outer atmosphere. Oslo Geophysists' Association 50 years) Chapter editor. 146 p, OGF Oslo
- 2000 **Governance for a Sustainable Future. A report by the World Humanity Action Trust. IV Working with Water, 53 p, WHAT London**
- 2003 **Dams and floods. Guidelines and case histories. International Commission on Large Dams, ICOLD Bulletin 125, Paris, 224 p.**
- 2004 **Clearing the Air. 25 years of the Convention on Long-range Transboundary Air Pollution. (eds.: Sliggers, J. and Kakebeeke, W.). UN Economic Commission for Europe, Geneva, 167 p.**

