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CURRICULUM VITAE

NAME Paul TRUONG

NATIONALITY Australian

POSITIONS

Board Director for Asia & Oceania
and Technical Director
The Vetiver Network International (TVNI)
Bellingham, Washington State, USA
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QUALIFICATIONS B. Agric. Sc. (Hons.1st Class), Ph.D. (Agronomy) (Queensland University, Brisbane, Australia)

CAREER HISTORY Principal Scientist
(1975- 2002) (Leader, Erosion Control and Phytoremediation Group)
Queensland Department of Natural Resources and Mines
80 Meiers Road, Indooroopilly Q 4068
BRISBANE, AUSTRALIA

2002- Now Director and Principal Consultant
VETICON CONSULTING Pty. Ltd

SPECIALISED FIELDS

Phytoremediation. Application of the Vetiver System in:

- Treating contaminated and polluted industrial wastewater, sewage effluent and landfill leachate
- Treating contaminated industrial and mining solid wastes

Soil Erosion and Sediment Control. Specialising in the use of vegetation (bioengineering) in the stabilisation and reclamation of unstable, erodible and degraded agricultural, urban and industrial lands, and mine rehabilitation. This involves:

- Selection of plant species, both introduced and native species suitable for different environments and requirements including saline lands.
- Development of practical techniques of establishing these species in hostile environments such as steep slope, acidic, alkaline and saline conditions.
- Determination of requirements needed for the persistence of these species under hostile environment.
- Development of sustainable techniques to maintain these species on these environments.

GLOBAL APPLICATIONS OF VETIVER SYSTEM TECHNOLOGY IN TREATING SEWAGE EFFLUENT, LANDFILL LEACHATE AND CONTAMINATED INDUSTRIAL WASTEWATER CONDUCTED BY VETICON

1. OCEANIA

- **Australia**
  - ***Sewage Effluent:*** Ephemeral wetlands and Irrigated dryland
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland
  - ***Industrial wastewater:*** Food processing factory and Abattoir
- **New Zealand**
  - ***Industrial wastewater:*** Urban runoff
- ***Papua New Guinea***
  - ***Industrial wastewater:*** Palm Oil plantation

2. AFRICA

- **Ethiopia**
  - ***Sewage Effluent*** Irrigated dryland
  - ***Industrial wastewater:*** Coffee processing effluent
- **Kenya**
  - ***Sewage Effluent*** Irrigated dryland
  - ***Industrial wastewater:*** Urban runoff
- **Morocco**
  - ***Sewage Effluent*** Irrigated dryland
  - ***Industrial wastewater:*** Food processing factory and Abattoir
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland
- **Nigeria**
  - ***Sewage Effluent*** Irrigated dryland
  - ***Industrial wastewater:*** Urban runoff
- **Senegal**
  - ***Sewage Effluent*** Irrigated dryland
- ***South Africa***
  - ***Sewage Effluent:*** Ephemeral wetlands and Irrigated dryland
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland

3. NORTH AMERICA

- **Mexico**
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland
- **USA**
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland

4. CENTRAL AMERICA

- **Costa Rica**
  - ***Sewage Effluent:*** Constructed wetlands
- **Guatemala**
  - ***Industrial wastewater:*** Urban runoff

5. SOUTH AMERICA

- **Brazil**
  - ***Landfill Leachate;*** Seepage control and Irrigated dryland
  - ***Sewage Effluent:*** Constructed wetlands
- **Chile**
  - ***Industrial wastewater:*** Urban runoff and piggery effluent
  - ***Contaminated water:*** Boron removal
- **Colombia**
  - ***Industrial wastewater:*** Coffee processing effluent, oil well effluent

- **Peru**
  - ***Industrial wastewater:*** Urban runoff
  - ***Sewage Effluent*** Irrigated dryland

- **Venezuela**
  - ***Industrial wastewater:*** Beer Factory
  - ***Contaminated water:*** Fluor removal

- **Colombia**
  - ***Industrial wastewater:*** Coffee processing effluent, oil well effluent

6. ASIA

- **China**
  - ***Landfill Leachate:*** Seepage control and Irrigated dryland
  - ***Industrial wastewater:*** Urban runoff and piggery effluent
- **India:**
  - ***Industrial wastewater:*** Urban runoff and factory effluent

- **Indonesia**
  - ***Sewage Effluent*** Irrigated dryland
  - ***Industrial wastewater:*** Urban runoff and factory effluent

- ***Kuwait***
  - ***Sewage Effluent*** Irrigated dryland

- ***Malaysia:***
  - ***Industrial wastewater:*** Urban runoff and Palm oil mill effluent

- ***Singapore***
  - ***Landfill Leachate;*** Seepage control and constructed wetland

- ***Thailand :***
  - ***Landfill Leachate;*** Seepage control and constructed wetland

- **Vietnam**
  - ***Industrial wastewater:*** Urban runoff, factory effluent, food processing factory
  - ***Sewage Effluent*** constructed wetland and Irrigated dryland

7. EUROPE

- **France**
  - ***Sewage Effluent*** constructed wetland and Irrigated dryland

- **Italy**
  - ***Sewage Effluent*** Irrigated dryland
- **Portugal**
  - ***Industrial wastewater:*** Urban runoff
  - ***Sewage Effluent*** Irrigated dryland

GLOBAL APPLICATIONS OF VETIVER SYSTEM TECHNOLOGY IN EROSION CONTROL AND SLOPE STABILISATION CONDUCTED BY VETICON

1. OCEANIA

- **Australia**
  - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
  - ***Dam wall and spill way stabilisation***: Queensland Water Resources
- **Papua New Guinea**
  - ***Batter stabilisation:*** Access road of Palm Oil plantation

2. AFRICA

- **Ethiopia**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
- ***South Africa***
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
- ***Uganda***
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways

5. SOUTH AMERICA

- **Brazil**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
    - ***Dam wall and spill way stabilisation***: State department of transport
- **Chile**
    - ***Batter stabilisation***: Highway and Riverbank stabilisation
- **Colombia**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways
- **Venezuela**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways

6. ASIA

- **China**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
- **India:**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways

- **Indonesia**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways

- ***Kuwait***
    - ***Sewage Effluent*** Irrigated dryland

- ***Malaysia:***
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways

- **Vietnam**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Ho Chi Minh Highways and Railways

7. EUROPE

- **Italy**
    - ***Batter stabilisation***: Stabilisation of steep road batters, culverts and table drains of Highways and Railways
- **Spain**
    - ***Batter stabilisation***: Stabilisation of steep batters in Murcia

GLOBAL APPLICATIONS OF VETIVER SYSTEM TECHNOLOGY IN MINE REHABILITATION CONDUCTED BY VETICON

1. OCEANIA

- **Australia**
    - ***Coal mines*** Stabilisation and rehabilitation of open cut mine overburden
    - ***Gold mines*** Stabilisation and rehabilitation of open cut mine overburden and tailings,

2. AFRICA

- ***South Africa***
    - ***Bauxite mines*** Stabilisation and rehabilitation of open cut mine overburden
    - ***Gold mines*** Stabilisation and rehabilitation of open cut mine overburden and tailings,

5. SOUTH AMERICA

- **Chile**
    - ***Copper mines*** Stabilisation and rehabilitation of open cut mine overburden and tailings,
- **Venezuela**
    - ***Bauxite mines*** Stabilisation and rehabilitation of open cut mine overburden

6. ASIA

- **China**
    - ***Lead-Zinc mines*** Stabilisation and rehabilitation of open cut mine overburden and tailings,
    - ***Bauxite mines*** Stabilisation and rehabilitation of open cut mine overburden
- **India:**
    - ***Iron mines*** Stabilisation and rehabilitation of open cut mine overburden
    - ***Flyash*** Stabilisation and rehabilitation of flyash dump
- **Indonesia**
    - ***Coal mines*** Stabilisation and rehabilitation of open cut mine overburden
    - ***Gold mines*** Stabilisation and rehabilitation of open cut mine overburden and tailings,

VETIVER RESEARCH AWARDS

Paul Truong has received three major **World Bank Research Awards**, one in 1991 for his pioneering research on the salt tolerance of vetiver grass and one in 1993 for its tolerance to low soil pH and aluminium and manganese toxicities. In 1999, 2000 and 2003 he received several awards from The Vetiver Network for his contribution to VS research and global dissemination.

In January 2 000 he was awarded the **King of Thailand Vetiver Award** for his research on the application of VS in environmental protection and later elected to the Board of The Vetiver Network International.

EXPERIENCE IN VETIVER RESEARCH, DEVELOPMENT AND APPLICATION

Paul Truong has been involving in soil conservation research and extension including the land rehabilitation and reclamation of degraded and salt affected lands in the last 30 years.

In the last 25 years he has concentrated on the development and application of the Vetiver System (VS) to Australian conditions, under both tropical and subtropical climates, from semi-

arid to wet tropics. He has conducted numerous vetiver research projects throughout Queensland, and has used vetiver grass as the main species in several projects including steep slope stabilisation on highway and railway batters, coal mine and gold mine tailings rehabilitation, quarry rehabilitation, gully stabilisation, stabilisation and revegetation of contaminated land and flood mitigation on the flood plain.

His pioneering work on the hydraulics of vetiver hedges in overland flow provided for the first time a basic understanding on hedge hydraulics needed for the application of the vetiver hedge system in erosion and sediment control on the flood plains of Queensland. He has also used VS extensively in the stabilisation of dike, dam, river and canal banks in Australia and overseas. In addition he has also used vetiver grass to support engineering structures and in some cases replacing some conventional runoff control structures.

As recognition of wide experience in Australia and overseas, he has been engaged as a consultant to several organisations in China, Chile, Venezuela, Thailand, South Africa, the Philippines, Mauritius, Malaysia and Vietnam, including the Royal Project Foundation, Chiang Mai, Thailand.

ADB, AUSAID, UNDP and USAID have engaged him as a VS specialist in environmental protection projects around the world.

SOME RECENT INTERNATIONAL EXPERIENCE AND PROJECTS

2004 Consultant to TVN and USAID as vetiver specialist for infrastructure protection in the Democratic Republic Congo.
2005 Invite speaker at the Mining Rehabilitation Conference in Santiago, Chile
2006 Keynote speaker and reviewer at the Fourth International Vetiver conference in Caracas, Venezuela, October 2006
2006 Consultant to Riau Pulp (paper Pulp manufacturer) as vetiver specialist for pollution and erosion control in Riau, Sumatre, Indonesia.
2008 Keynote speaker and reviewer at the First National Indian Vetiver conference in Kochi, Kerala, India, Feb 2008
2008 Consultant to Asian Development Bank as vetiver specialist for pollution and erosion control in the Citarum Bassin, Java, Indonesia.
2009 - Invite speaker at the national Vetiver Conference in Nairobi, Kenya
- Invite speaker at the international Vetiver Conference in Addis Ababa, Ethiopia
2010 - Invite keynote speaker at the First Latin American International Vetiver Conference in Santiago, Chile (October)
2010 - Invite to conduct Training course for Vetiver applications in Environmental Protection at Itaipi University, Santa Carolina State, southern Brazil, (November)
2011 - Invite keynote speaker at the Indonesian Road Engineering Institute International Seminar on Green Road Construction, Bandung (November)
2011 - Invite keynote speaker at the Fifth International Vetiver Conference (ICV5) Lucknow, India (November)
2013 - Invite keynote speaker at the Second Latin American International Vetiver Conference in Medellin, Colombia (October)
2014 - Invite keynote speaker at the Brazilian Bioengineering Conference in San Luis, Brazil (November)
2015 - Invite keynote speaker at the Sixth International Vetiver Conference (ICV6) Da Nang, Vietnam (May)

2016 - Invite keynote speaker at the Indian Vetiver Network Conference in Coimbatore, Tamil Nadu, India (April)

2016 - Invite keynote speaker at the Ganges Riverbank Stabilisation Conference in Nadia, West Bengal, India (April)

SOME RECENT PUBLICATIONS ON VETIVER RESEARCH, DEVELOPMENT AND APPLICATIONS

Over 200 publications and reports in erosion and sediment control techniques, rehabilitation and phytoremediation using the Vetiver System. The following a selected recent publication in wastewater management.

1. Truong, P. and Luu Thai Danh (2015). The Vetiver System For Improving Water Quality: Prevention And Treatment Of Contaminated Water And Land - Second Edition (English 2015 and Spanish edition, 2016)
2. Truong, P., Granley, B. and Maria I Calderon, M. (2012) Landfill Leachate and Wastewater Treatment and Disposal: Some Case Studies. Global Waste Management Symposium, Phoenix, Arizona, USA
3. Granley, B. and Truong, P. (2012), A Changing Industry: On-site Phytoremediation of Landfill Leachate Using Trees and Grasses – Case Studies. Global Waste Management Symposium, Phoenix, Arizona, USA
4. Truong, P. N.V (2008). Vetiver System for Prevention and Treatment of Polluted Water and Contaminated Land. Proc. First Indian National Vetiver WorkShop, Cochi, Kerala, India , Feb 2008
5. Truong P. N.V, Tran Tan Van, and Pinners, E. (2008). Vetiver System Applications-Technical Manual. Publ. The Vetiver Network International. (Second Edition, Color)
6. Truong, P and Booth, D (2007). Potential Applications of the Vetiver System for Urban Wastewater Treatment and Disposal In Indonesia. Waste Water Management Technology Innovation Workshop, Housing & Sanitation Development, Indonesian Public Works Department, Novotel Hotel Surakarta, 2 October 2007.
7. Truong, P. (2006). Vetiver System for Prevention and Treatment of Contaminated Land and Water. Proc. Fourth International Vetiver Conference, Caracas, Venezuela, Oct 2006
8. Smeal, C., Truong,P., Biala J. and Butler A.(2006).Application Of Vetiver Grass In Soil Based Reed Beds For Effluent Treatment At Gelita APA, Australia. Proc. Fourth International Vetiver Conference, Caracas, Venezuela, Oct 2006
9. Truong, P. (2005). Vetiver Grass for Mine Site Rehabilitation and Reclamation. Forum Sustentare, July 2005, Santiago, Chile.
10. Ash, R and Paul Truong P. (2004). The use of vetiver grass for sewerage treatment. Proc. Sewage Management: "Risk Assessment and triple bottom line" Conf. Queensland EPA. April 5-7, Cairns, Australia.

16. Truong, P. (2003). Clean Water Shortage, an Imminent Global Crisis: How Vetiver System can reduce its impact. Review paper. Proc.Third International VetiverConference, Guangzhou, China, October 2003

13. Truong, P. and Smeal (2003). Research, Development and Implementation of Vetiver

System for Wastewater Treatment: GELITA Australia. Technical Bulletin No. 2003/3. Pacific Rim Vetiver Network. Office of the Royal Development Projects Board, Bangkok, Thailand.

14. Hart, B., Cody, R., and Truong, P. (2003). Efficacy of Vetiver Grass in the Hydroponic Treatment of Post Septic Tank Effluent. Proc.Third International Vetiver Conference, Guangzhou, China, October 2003
15. Percy, I., and Truong, P. (2003). Landfill Leachate Disposal with Irrigated Vetiver Grass. Proc.Third International Vetiver Conference, Guangzhou, China, October 2003
16. Truong, P.N. (2000). Vetiver Grass Technology. In Vetiveria, Ed. M. Maffei, Harwood Academic Pub. Amsterdam, Chapter 9.
17. Truong, P.N., Mason, F., Waters, D. and Moody, P. (2 000). Application of Vetiver Grass Technology in off-site pollution control. I. Trapping agrochemicals and nutrients in agricultural lands. Proc. Second Intern. Vetiver Conf. Thailand, January 2000.
18. Cull, R.H., Hunter, H., Hunter, M. and Truong, P.N. (2 000). Application of Vetiver Grass Technology in off-site pollution control. II. Tolerance of vetiver grass towards high levels of herbicides under wetland conditions. Proc. Second Intern. Vetiver Conf. Thailand, January 2000.
19. Ground and Water Bioengineering for Erosion Control and Slope Stabilisation. Manila, Philippines, April 1999.