



GSE 829

Pollution Control and Waste Management

S2 Evening 2015

Dept of Environmental Sciences

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General Information

Unit convenor and teaching staff

Vladimir Strezov

vladimir.strezov@mq.edu.au

Joanna Stewart Priestley

joanna.stewartpriestley@mq.edu.au

Credit points

4

Prerequisites

GSE803

Corequisites

Co-badged status

Unit description

This unit examines scientific and engineering principles in managing waste, the industrial control of pollutant emissions, and options for cleaner industrial production. The unit introduces students to industrial environmental practices, industrial ecology and industrial environmental quality control. Note: permission to complete the unit without completion of GSE803 as a prerequisite will only be granted if the student has completed a science-based degree.

Important Academic Dates

Information about important academic dates including deadlines for withdrawing from units are available at <https://www.mq.edu.au/study/calendar-of-dates>

Learning Outcomes

On successful completion of this unit, you will be able to:

1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems; o

prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance

3. Appreciate the requirements for corporate capital and operating inputs for effective pollution control and waste management.

4. Know of the essential regulatory requirements for pollution control and waste management systems.

5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

Assessment Tasks

Name	Weighting	Due
<u>Critical Literature Review</u>	40%	Week 9
<u>4 take home exercises</u>	40%	Weekly
<u>Presentation and Participation</u>	20%	Weeks 12 and 13

Critical Literature Review

Due: **Week 9**

Weighting: **40%**

An assignment of 4,000 words in the form of a critical literature review on one of a range of set subjects. A thorough search and critical and comparative assessment of the relevant scientific and professional literature will be necessary. This assessment will review, assess and evaluate the scientific information in relation to technologies and environmental management.

The Assessment Task relates to the following learning outcomes:

- Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management.
- Apply this understanding of pollution control techniques and equipment and waste management systems to making preliminary assessments of where such techniques, equipment or systems are likely to be required; assessments of the likely effectiveness; preparation of a brief, in terms of desired outcomes, for the expert design; preparation an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; identifying the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic

checking of environmental performance.

- Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

On successful completion you will be able to:

- 1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
 - o prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems;
 - o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance
- 4. Know of the essential regulatory requirements for pollution control and waste management systems.
- 5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

4 take home exercises

Due: **Weekly**

Weighting: **40%**

Four (4) tutorial exercises will be distributed approximately fortnightly from the second week, based on lectures. Students must complete all 4. It is important that they are completed promptly following the lectures to reinforce the learning process.

Marks: 10 marks for each exercise; 40% of the total unit mark. Due: Weekly, ie. Exercise 1 (Week 3) due on Week 4. There will be some weeks with no exercises set.

Late exercises: Late penalties - 0.5 mark for each day of late submission. No exercise will be accepted two weeks after its due date.

The Assessment Task relates to the following Learning Outcomes:

1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
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- making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
 - prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems;
 - identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance
3. Appreciate the requirements for corporate capital and operating inputs for effective pollution control and waste management.
 4. Know of the essential regulatory requirements for pollution control and waste management systems.

On successful completion you will be able to:

- 1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
 - prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems;
 - identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance
- 3. Appreciate the requirements for corporate capital and operating inputs for effective pollution control and waste management.
- 4. Know of the essential regulatory requirements for pollution control and waste management systems.
- 5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

Presentation and Participation

Due: **Weeks 12 and 13**

Weighting: **20%**

Students will be assigned to groups with individual topics in week 6 to work on the issues, opportunities and challenges of the practical application of technologies for pollution control and waste management.

The mark will consist of 10 % for group work and 10% for individual presentation and participation.

Assessment Task relates to the following Learning Outcomes:

1. Apply understanding of pollution control techniques and equipment and waste management systems to:
 - making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
 - prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems;
 - identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance
2. Appreciate the requirements for corporate capital and operating inputs for effective pollution control and waste management.
3. Know of the essential regulatory requirements for pollution control and waste management systems.
4. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

On successful completion you will be able to:

- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
 -

prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance

- 3. Appreciate the requirements for corporate capital and operating inputs for effective pollution control and waste management.
- 4. Know of the essential regulatory requirements for pollution control and waste management systems.
- 5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

Delivery and Resources

There is no set text for this unit. The following lists some useful references.

A. Books

Some standard texts and handbooks are often helpful starting points:

- Environmental Protection:
 - Corbitt R 1999 *Standard handbook of environmental engineering* McGraw Hill, New York. (TD145 .S72/1999)*
 - Kiely G 1996 *Environmental engineering* McGraw Hill, New York.
 - Manahan S 2000 *Environmental chemistry* (4-7th ed.), Lewis, Chelsea. (TD193 .M36/2000)*
 - Lewis R 1994 *Sax's Dangerous properties of industrial materials: Encyclopedia of chemical technology* 1993 update. 8th ed. Van Nostrand Reinhold, New York. (T55.3.H3.L4852/1994, Reference Collection)
- Air Pollution:
 - Buonicore A & Davis W 1992 *Air pollution engineering manual* Van Nostrand Reinhold, New York. (TD889 .A39/1992)*
- Water Pollution:
 - Eckenfelder W 1989 *Industrial water pollution control* McGraw Hill, New York.
 - Tchobanoglous G & Burton FL 1991 *Wastewater engineering: treatment, disposal and reuse* Metcalf & Eddy McGraw Hill, New York. (1985 edition at TD645 .M57)*
- Noise
 - Brüel & Kjaer 1986 *Noise control: principles and practice* Naerum:Brüel & Kjaer, Denmark. (TD892 .N62)*

- Waste
 - Tchobanoglous G, Theisen H & Eliassen R 1977 *Solid wastes: engineering principles and practice* McGraw Hill, New York.
 - Manahan S 1990 *Hazardous waste chemistry, toxicology, and treatment* Lewis, Chelsea. (TD1030 .M37/1990)*

Some of these texts have more recent editions.

Books of more general interest

An Australian book which shows how chemistry is involved in modern society is:

Selinger B 2000 *Chemistry in the Marketplace* (5th ed.) Allen & Unwin.

An environmental chemistry textbook prepared for Australian HSC students is:

Laidler G *Environmental Chemistry: an Australian Perspective* (a secondary school text).

Students who consider their background in chemistry to be weak may wish to consult basic chemistry texts which emphasise environmental matters. Examples of these may be found in the Library. Two text books which are currently used as first year texts are:

Smith R., *Conquering Chemistry*.

Zumdahl S., *Chemistry*.

B. Journals

There are now so many professional journals in this area that naming has real limitations. With that qualification, a few are mentioned here as likely starting sources for scientific and technical information:

Professional literature (journals):

- Australian:
 - *Clean Air & Environmental Quality* (CASANZ)
 - *Water* (AWA)
- International:
 - *Chemosphere* (toxics)
 - *Environmental Pollution*
 - *Environmental Science & Technology*
 - *Journal of the Air & Waste Management Association* (air)
 - *Journal of Cleaner Production*
 - *Journal of Environmental Engineering* (water)
 - *Journal of Water Environment Federation*
 - *Waste Management*
 - *Water Science and Technology*

General journals

- *Ecos*
- *Ambio*
- *Environment*
- General science magazines:

Search, Science, Nature, New Scientist, Scientific American.

Other sources

A large amount of information, including technical information, is now available on public web sites - mainly government sites – both in Australian and overseas. Some areas to search include:

- Environment Australia
- National Pollutant Inventory
- Australian state Environment Protection Authorities
- US Environmental Protection Agency
- Environment Canada

Some useful internet addresses

National

National Environment Protection Council <http://www.nepc.gov.au/>

Commonwealth

Environment Australia (Commonwealth) <http://www.erin.gov.au/>

National Pollutant Inventory <http://www.environment.gov.au/epg/npi/>

Natural Heritage Trust (Commonwealth) <http://www.nht.gov.au/>

State

EPA (NSW) <http://www.epa.nsw.gov.au/>

EPA (Vic) <http://www.epa.vic.gov.au/>

Dept of Environment and Heritage (Qld) <http://www.env.qld.gov.au/>

Dept of Environment (Tas) <http://www.del.mtas.gov.au/>

EPA (SA) <http://www.epa.sa.gov.au/>

Environment Department (WA) <http://www.environs.wa.gov.au/>

International

World Bank <http://www.worldbank.org/>

Environment Canada <http://www.ec.gc.ca/>

UK Environmental Agency <http://www.environment-agency.gov.uk>

US Environmental Protection Agency <http://www.epa.gov/>

Unit Schedule

Date	Topics	Lecturer
29 th July	Unit overview Introduction to Environmental Pollution Regulatory aspects	J Stewart Priestley
5 th August	Stoichiometry Gas laws Acidity & oxidation/reduction Biochemical reactions	J Stewart Priestley
12 th August	Emissions from combustion Dispersion Stack height Greenhouse gas emissions	V Strezov
19 th August	Particles and pollution Fluid flow Dust Particle control	V Strezov
26 th August	Noise and vibrations Noise abatement Fugitive emissions Ventilation Odour control	J Stewart Priestley

2 nd September	<p>Sewage collection</p> <p>Trade waste</p> <p>Water treatment for process use</p> <p>Effluent treatment</p> <p>Stormwater management</p>	J Stewart Priestley
9 th September	<p>Soils and waste management</p> <p>Solid waste generation and disposal</p> <p>Toxic waste handling and disposal</p>	V Strezov
	Mid-SEMESTER BREAK	
30 th September	<p>Scenario Practical Exercise</p>	J Stewart Priestley
7 th October	<p>Industrial ecology</p> <p>Risk assessment</p> <p>Risk management</p> <p>Due Diligence</p> <p>Assignment due</p>	J Stewart Priestley
14 th October	<p>Visit to Macarthur waste recovery park and St. Mary's recycling plant.</p>	V Strezov

21 st October	Environmental Management Systems Environmental Auditing Monitoring and Regulations	J Stewart Priestley
28 th October	Presentation of group work projects #1	J Stewart Priestley
4 th November	Presentation of group work projects #2	J Stewart Priestley

Policies and Procedures

Macquarie University policies and procedures are accessible from [Policy Central](#). Students should be aware of the following policies in particular with regard to Learning and Teaching:

Academic Honesty Policy http://mq.edu.au/policy/docs/academic_honesty/policy.html

Assessment Policy <http://mq.edu.au/policy/docs/assessment/policy.html>

Grading Policy <http://mq.edu.au/policy/docs/grading/policy.html>

Grade Appeal Policy <http://mq.edu.au/policy/docs/gradeappeal/policy.html>

Grievance Management Policy http://mq.edu.au/policy/docs/grievance_management/policy.html

Disruption to Studies Policy http://www.mq.edu.au/policy/docs/disruption_studies/policy.html *The Disruption to Studies Policy is effective from March 3 2014 and replaces the Special Consideration Policy.*

In addition, a number of other policies can be found in the [Learning and Teaching Category](#) of Policy Central.

Student Code of Conduct

Macquarie University students have a responsibility to be familiar with the Student Code of Conduct: https://students.mq.edu.au/support/student_conduct/

Results

Results shown in *iLearn*, or released directly by your Unit Convenor, are not confirmed as they are subject to final approval by the University. Once approved, final results will be sent to your

student email address and will be made available in [eStudent](#). For more information visit [ask.mq.edu.au](#).

Student Support

Macquarie University provides a range of support services for students. For details, visit <http://students.mq.edu.au/support/>

Learning Skills

Learning Skills (mq.edu.au/learningskills) provides academic writing resources and study strategies to improve your marks and take control of your study.

- [Workshops](#)
- [StudyWise](#)
- [Academic Integrity Module for Students](#)
- [Ask a Learning Adviser](#)

Student Services and Support

Students with a disability are encouraged to contact the [Disability Service](#) who can provide appropriate help with any issues that arise during their studies.

Student Enquiries

For all student enquiries, visit Student Connect at ask.mq.edu.au

IT Help

For help with University computer systems and technology, visit <http://informatics.mq.edu.au/help/>.

When using the University's IT, you must adhere to the [Acceptable Use Policy](#). The policy applies to all who connect to the MQ network including students.

Graduate Capabilities

PG - Capable of Professional and Personal Judgment and Initiative

Our postgraduates will demonstrate a high standard of discernment and common sense in their professional and personal judgment. They will have the ability to make informed choices and decisions that reflect both the nature of their professional work and their personal perspectives.

This graduate capability is supported by:

Learning outcomes

- 1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
- 2. Apply this understanding of pollution control techniques and equipment and waste

management systems to: o making preliminary assessments of where such techniques, equipment or systems are likely to be required; o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems; o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems; o prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance

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- 5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

Assessment tasks

- Critical Literature Review
- 4 take home exercises
- Presentation and Participation

PG - Discipline Knowledge and Skills

Our postgraduates will be able to demonstrate a significantly enhanced depth and breadth of knowledge, scholarly understanding, and specific subject content knowledge in their chosen fields.

This graduate capability is supported by:

Learning outcomes

- 1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to: o making preliminary assessments of where such techniques, equipment or systems are likely to be required; o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems; o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems; o prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic

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Assessment tasks

- Critical Literature Review
- 4 take home exercises
- Presentation and Participation

PG - Critical, Analytical and Integrative Thinking

Our postgraduates will be capable of utilising and reflecting on prior knowledge and experience, of applying higher level critical thinking skills, and of integrating and synthesising learning and knowledge from a range of sources and environments. A characteristic of this form of thinking is the generation of new, professionally oriented knowledge through personal or group-based critique of practice and theory.

This graduate capability is supported by:

Learning outcomes

- 1. Understand the basic scientific and technical principles involved in air, water and noise pollution control and waste management
- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
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public audiences and express findings in clear and cogent reports.

Assessment tasks

- Critical Literature Review
- 4 take home exercises
- Presentation and Participation

PG - Research and Problem Solving Capability

Our postgraduates will be capable of systematic enquiry; able to use research skills to create new knowledge that can be applied to real world issues, or contribute to a field of study or practice to enhance society. They will be capable of creative questioning, problem finding and problem solving.

This graduate capability is supported by:

Learning outcomes

- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
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Assessment tasks

- Critical Literature Review
- 4 take home exercises
- Presentation and Participation

PG - Effective Communication

Our postgraduates will be able to communicate effectively and convey their views to different

social, cultural, and professional audiences. They will be able to use a variety of technologically supported media to communicate with empathy using a range of written, spoken or visual formats.

This graduate capability is supported by:

Learning outcomes

- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the likely effectiveness of such techniques, equipment or systems;
 - o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems;
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- 5. Critically analyse pollution control and waste matters for management, specialist and public audiences and express findings in clear and cogent reports.

Assessment tasks

- Critical Literature Review
- 4 take home exercises
- Presentation and Participation

PG - Engaged and Responsible, Active and Ethical Citizens

Our postgraduates will be ethically aware and capable of confident transformative action in relation to their professional responsibilities and the wider community. They will have a sense of connectedness with others and country and have a sense of mutual obligation. They will be able to appreciate the impact of their professional roles for social justice and inclusion related to national and global issues

This graduate capability is supported by:

Learning outcomes

- 2. Apply this understanding of pollution control techniques and equipment and waste management systems to:
 - o making preliminary assessments of where such techniques, equipment or systems are likely to be required;
 - o make preliminary assessments of the

likely effectiveness of such techniques, equipment or systems; o prepare a brief, in terms of desired outcomes, for the expert design of such techniques, equipment or systems; o prepare an outline management plan for the operation, maintenance and monitoring of such techniques, equipment or systems; o identify the likely types of risks encountered in the operation, maintenance and monitoring and specify audit requirements for periodic checking of environmental performance

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Assessment tasks

- 4 take home exercises
- Presentation and Participation