

Environment Report 2008

1 Executive Summary

In the fourth Global Environment Outlook: environment for development (GEO-4) assessment report, Mr Ban Ki-moon, Secretary-General of the United Nations, had aptly expressed the urgency and importance of managing global environmental issues such as climate change and water "...the dangers of global warming, environmental degradation, the loss of biodiversity and the potential for conflict growing out of competition over dwindling natural resources such as water...Dealing with these issues is the great moral, economic and social imperative of its time."

Similarly, in a speech at the 7th Shangri-La Dialogue on 30 May 2008, Prime Minister Lee Hsien Loong said:"...Climate change will lead to more extreme weather conditions, and likely reduce the supply of fresh water and arable land. The impact of a chronic food shortage will be felt most keenly by poor countries... could lead countries to compete for scarce resources, and that displacement of large populations across borders could deepen tensions and provoke conflicts and wars."

With limited natural resources and a large urban population of approximately 4.4 million people, land-scarce Singapore needs to carefully manage these environmental issues, both globally and locally to make this island an environmentally-sustainable city.

Senoko accepts the science of climate change and the importance of environmental issues. It places environmental concerns among the Company's highest priorities. It has consciously integrated the Singapore Green Plan 2012 into all its business decisions.

Clean Air and Climate Change

The replacement of its oil-fired generation with state-of-the-art gas-fired combined cycle turbine technology, at a cost of S\$600m, reduces its carbon dioxide emission by 2.5 million tons per annum, broadly equivalent to taking all the cars off the road. It generated more electricity and still achieving lower CO₂ emission lower than 1990's. In 1990, it produced 8.85 TWh with 6.19 million tones CO₂. By 2007, it had 11.92 TWh at 5.19 million tones CO₂. Its carbon intensity emission was reduced by 40% from 1990 level, two times higher than the national average of 20%. To-date, 95% of its electricity generation comes from clean natural gas-fired generating plants.

It reduced nitrogen-based emissions to 73 mg/Nm³, way below the statutory requirement of 700 mg/Nm³, by retrofitting the burners of four older gas turbines to the tune of \$17m.

To inculcate a sense of awareness of the impacts of climate change on the way we will live its life among the community, it adopted a long term approach and focus its attention on the decision-makers of tomorrow, which are the today's students. It conceived the National Weather Study Project (NWSP) in March 2005 to promote awareness of environmental issues among students, the public and the private organisations. Students work on projects that focussed on improving Singapore's environment. Projects addressing issues top on national environmental agenda were popular. Today, the NWSP has received widespread endorsement from government ministries, statutory boards, academics, non-governmental organisations, conservation action groups, private organisations and the public. It also demonstrates different ministries, agencies and organizations working together for a common cause & supporting each other to spread the message further and wider.

NWSP has succeeded in attracting the sponsorship and endorsement of MNC such as Siemens, ABB and Alstom. These MNCs become a host of visit by NWSP winners at



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overseas showcase. Siemens went one step further by committing itself financially as the co-organiser of NWSP 2009, which will be launched on 24 July 2008 at Science Centre.

Water

Senoko built, installed and operated its own 2,400 m³/day desalination plant. Together with NEWater, it now provides all its water needs for industrial purposes. As a result, its town water consumption was reduced by 80% since 2004.

Senoko will gradually increase use of Newater over town water. With anticipated repowering of Senoko Stage 2 generating plants by 2010, services such as fire fighting and power plant equipment washing will switch over from using town water to Newater.

Senoko improves water efficiency from 9.58 KWh/litre in 2004 to 11.16 KWh/litre in 2006. A number of major activities required more water to be consumed in 2007, leaving it at 10.09 KWh/litre.

In June 2008, Senoko adopted Sungei Sembawang, both for improving water quality and aesthetics quality of waterways. The plan is to invite 10 schools to join in the adoption. These schools can then play an active role in preserving the waterways through activities such as litter pick-up. To date, two schools had participated in litter clean-up event. The next exercise on 18 July 2008 will involve another three different schools. Senoko will be organising the same litter-free campaign along Sungei Sembawang every 3-4 months. It has committed to undertake monthly water sample analysis, with the result (started since May 2008) feedback to PUB.

A brochure detailing the history, the surrounding bio-diversity, the areas of attraction and the map of Sungei Sembawang is on the drawing board. Waterway Watch Society and Senoko will jointly develop it. The plan is to complete the brochure by September 2008.

The softcopy of the brochure will then be distributed to participating schools located at the vicinity of Sungei Sembawang. These schools will be encouraged to add on unique water conservation features or projects the schools have undertaken such as litter pick-up organised by Senoko Power. Individual schools will then print the brochures with funding from Senoko. The school's students will distribute "their brochure" to their adjacent neighbourhoods to seek buy-in from the residents so that they become more aware of the activities happening and keep an eye on environment along Sungei Sembawang, to truly reflect national goal of 'City of Gardens and Water' for all to conserve, value and enjoy.

With the brochure, Senoko will approach organisations around the vicinity and encourage them to join in the adoption and participate in the activities.

Senoko believes that through the concerted effort of the whole neighbourhood, incident such as the water pollution in Sungei Sembawang on 12 June 2008 caused by contaminated fire-fighting water being discharged into the waterway from a factory fire at Woodlands Terrace can be minimised.

Employees and contractors were not forgotten. A series of EHS refresher workshop with strong emphasis in water conservation were conducted for all internal employees and key contractors. A water conservation handbook will be made available to all staff. The inclusion of suggestions on water conservation and water sports activities in the Work Improvement Suggestion Scheme further promotes water message.



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Waste Management

Senoko power plant construction projects are testimonial of infrastructure re-use. Senoko Stage 1 Re-powering in 2000-2004 retained the use of prime mover foundation, seawater cooling system and electrical transformers. It saved about 15% of the cost and shortened construction by about a year. It was the first of its kind in the region. Similar concept will apply in Senoko Stage 2 Re-powering in 2009-2011.

Senoko believes that if everyone can make small habitual changes to the lifestyle over a sustained period, each of us can reduce overall carbon footprint and collectively make a difference. Its Eco Action 2008 encourages employees to take public transport or car pool, set default air-con temperature at 25°C and switch off lights during lunch breaks. Coupled with various energy conservation efforts, Senoko has been able to realise its internal energy and carbon savings.

Senoko also seeks to play an active role in encouraging waste minimization in the community. It sponsored SECDC in the Recycling Actions by Caring Hearts at South East (REACH@SE) programme. The REACH@SE programme aims to create greater awareness on the importance of waste minimisation and recycling among students and teachers.

Senoko also sponsored NUS in their university-wide environmental initiative Rebate2Earth, which aims to minimize the excessive and often unnecessary usage of plastic bags in NUS campus.

Public Health

Senoko deploys independent EHS auditor to spot areas which may breed mosquitoes. It conducts quarterly indoor air quality checks of working office. The readings on total bacteria count, total yeast, mould count and respiratory dust are consistently below the upper limit. This helps to ensure air quality is of reasonable level and its employees have a healthy working environment.

Conserving Nature

Despite space constraints, Senoko makes an effort to reserve between 10 and 15 per cent of its premises for greenery.

Senoko has also allocate a vacant plot land within power station for Peixin Primary School to experiment planting Rosella, which is similar to Rebena, to make health drinks and tasty pastes/jams.

Every year, Senoko supports Woodgrove Secondary School in planting tree at the nature reserve park during their green camp.

Industry and Community Partnerships

Senoko aspires to be a leader in adopting green technologies and setting the standards in environmental responsibility for peer organisations. It also wants to demonstrate how the private sector can work with various partners to raise public awareness of climate change through community initiatives.



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The NWSP is a classic example of how various stakeholders (ministries, agencies, NGOs, institutions, public and private sectors) can pool resources and come together to promote awareness in climate change among the community. In addition, the involvement of 150 judges from various organizations spread the message to a wider audience.

The Central Data Depository (CDD) is a project that has spun off from the NWSP. The CDD database provides the weather data affecting Singapore environment.

Senoko adopted a total of 15 schools under the auspices of NEA Corporate & School Partnership Programme (CASP). Besides supporting these adopted schools to showcase their environmental project at Clean & Green Singapore Schools' Carnival in November each year, it developed different programmes to suit the needs of each school. Senoko contributions include

- Create a 3-year scholarship at Woodgrove Secondary School to reward academically-able green club members from lower income family,
- Serve in Peixin Primary School Advisory Committee,
- Allocate vacant plot land within power station to Peixin Primary School to experiment planting Rosella,
- Invest in mini energy centre of Peixin Primary School using wind turbine and solar panels,
- Promote green brochure on the bio-diversity of Yishun Park & Sungei Sembawang to garner the attention of residents around the schools and the waterway,
- Provide Teachers Work Attachment and Students Work Attachment so that teachers and students gain insights on how Senoko operates in an environmentally responsible manner while maintaining sustainability;
- Adopt hybrid orchid developed by Chongfu Primary; and
- Sponsor mid-June holiday environmental camps for primary school students hosted by Hwa Chong Institute.

Senoko provides expertise and financial support to several NGOs in their environmental movements, such as the CSR Movement and the Singapore Waters Programme. Furthermore, its human resource policies encourage employees to participate in community programmes. One of its staff even won the Eco Friend Award in 2007.

International Environmental Relations

The NWSP 2006 winning teams and their teacher-mentors went on a fully-sponsored trip to Australia in July 2006 to showcase their projects, while NWSP 2007 winners and their mentors showed case their projects during a fully-sponsored trip in Switzerland. The NWSP serves as a platform for local students to showcase their work internationally and exchange ideas with their peers from Singapore and elsewhere. Senoko believes that the international exposure aid the transfer of ideas, promote learning & understanding of different cultures, languages and religions.



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2 About Senoko Power

Care for the environment ranks among the top priorities at Senoko. It operates its businesses in a manner that ensures a healthy and clean environment for its employees, customers and the public.

Under its corporate policy, the company's facilities comply with Government's environmental requirements and the potential environmental impacts arising from its operations are minimised. Senoko employs professional engineers and chemists who integrate environmental considerations into industrial processes at its plant, monitor the environment and assess the plant's activities.

Environmental Policy

Its environmental policy can be summarised in the word "GREEN":

- governing key business decisions with full regard to environmental considerations
- resource efficiency and effectiveness together with minimising pollution at source
- excellent standard of environmental management and sustainable improvement
- emulating environmental regulations and standards
- nurturing environmental awareness and environmental responsibility in its employees

Its approach to Environmental Control

To achieve the above environmental policy, it:

- adopts cost-effective measures to reduce greenhouse emissions and minimise the environmental impact of any new development
- embraces the principles of waste minimisation and pollution control at source
- uses of energy, materials and natural resources efficiently
- protects the natural environment in all its operations
- establishes, reviews and reports environmental targets and performance
- complies with legal obligations and industry agreements in word and deed
- implements and regularly reviews its environmental management system
- promotes environmental responsibility among employees and partners
- engages all interested parties on environmental issues
- supports local environmental initiatives
- participates in regional collaborations on environmental protection

Its GREEN environmental policy is developed by its Environmental Steering Committee. Its division heads and section heads are tasked with implementing the policy. All employees are expected to adhere to this policy, and its partners are encouraged to observe the policy as well.

Senoko's commitment goes far beyond compliance with the environmental laws and regulations governing its industry. It encompasses a broader obligation to conduct its business as a responsible steward of the environment.

ISO 14001 Environmental Management System (EMS)

Senoko Power is the first power generation company (GenCo) in Singapore to be awarded the ISO 14001 certification. Its environmental management system covers policy, commitment, evaluation, review and improvement.

Corporate environmental objectives are defined in addition to local regulatory requirements. These goals include:

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- targets on emissions reduction
- sponsorships for community-based environmental awareness projects
- a company-wide system for disseminating environment-related information

These objectives are stated in its Annual Business Plan and monthly progress reports are prepared for the Board's review. New targets are also added whenever necessary.

Independent environmental health and safety (EHS) inspectors conduct monthly checks for safety & environmental compliance, and to ensure that there are no potential mosquito breeding grounds on-site. The inspectors have found Senoko consistently complies with EHS regulations. It also continuously improves on-site conditions and promotes greater awareness among the employees.

Half-yearly surveillance audits by TUV-SUD-PSB Certification Singapore consistently highlight its active involvement in both the environment and community circles.

Singapore Green Plan (SGP) 2012 Award

In 2005, Senoko became the first GenCo in Singapore to be given the SGP2012 award. The award recognised its leadership in reducing greenhouse emissions and educating the young on climate change.



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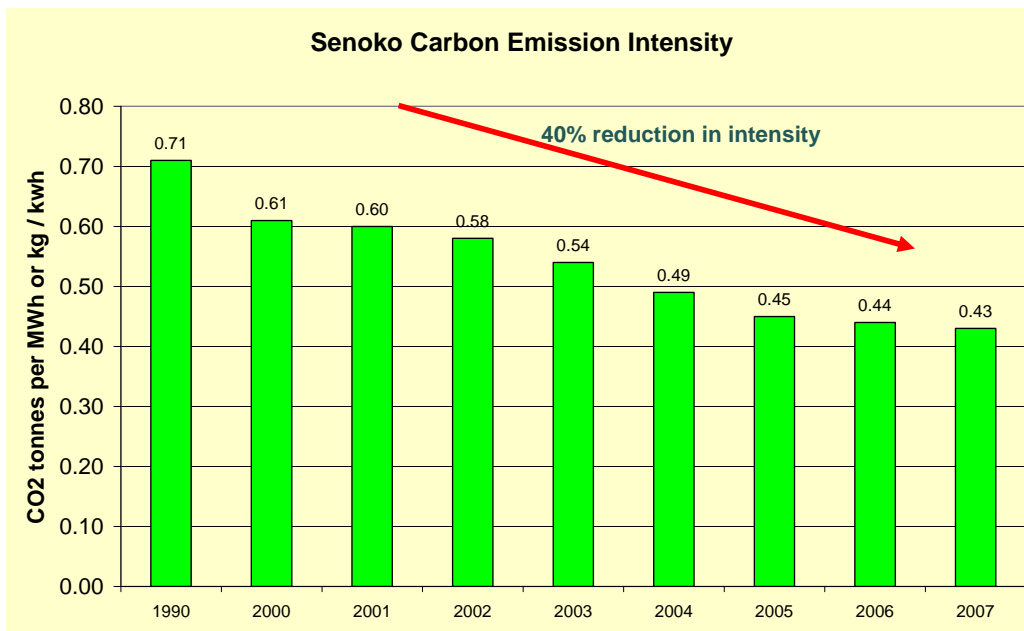
3 Clean Air and Climate Change

Climate change is an undeniable reality today, and is currently right at the top of the global agenda. The Stern Review on the Economics of Climate Change, published on 30 October 2006, suggested that if countries took immediate action to curb greenhouse emissions, the future costs of climate change would just be a mere 1 per cent of their GDP. However, if nations were to delay such actions, the costs could be as high as 20 per cent.

To date, Senoko has invested over \$600 million in new technologies to reduce greenhouse emissions.

3.1 Generation from natural gas

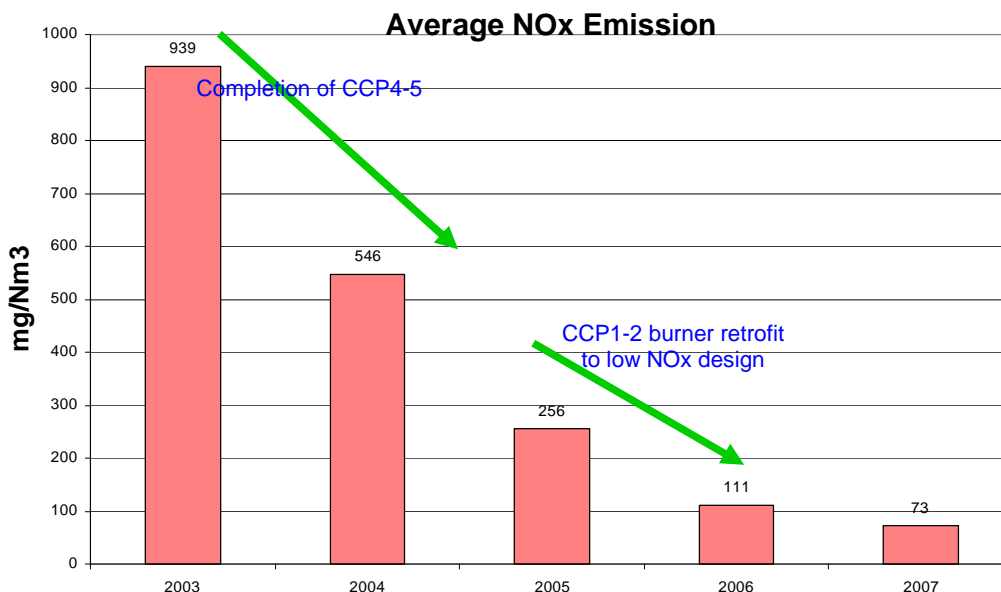
As the pioneer in bringing natural gas into Singapore and replacing oil-fired steam plants with gas-fired combined cycle plants (CCPs), Senoko has set the benchmark in environmental responsibility for the local power generation market. In 2007, 90 per cent of its power output is derived using natural gas, compared to the market average of 80 per cent. Its generation efficiency has also reduced its carbon intensity by more than 36 per cent since 1990, far exceeding the target of 25 per cent set in the National Climate Change Strategy. Its generation efficiency has enabled it to pass the benefits to the consumers.



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3.2 Low NOx Burner

All gensets in Senoko are equipped with low-NOx burners. We have spent \$16 million to retrofit the burners of its CCPs 1 and 2, to lower the NOx emission level in line with the new statutory requirement of 700mg/Nm³. Since then, the NOx level is generally a few hundred mg per Nm³.



3.3 Ultra Low Sulphur Diesel (ULSD)

One of the targets in SGP2012 is to reduce the ambient Particulate Matter 2.5 level to within an average of 15 µg/Nm³ by 2014. Senoko was the first GenCo in Singapore to adopt ULSD for its back up diesel fuel generation before the regulatory deadline of October 2006, despite the fact that diesel is seldom used in electricity generation.

3.4 National Weather Study Project (NWSP)

Launched in 2005, the NWSP was conceptualised to raise awareness among the student population of how the climate and weather patterns can impact the environment and its lives. Senoko set aside a sum of \$1 million to equip participating primary schools, secondary schools and junior colleges with mini-weather stations to measure and analyse wind speed, wind direction, humidity, rainfall, temperature and solar intensity. The students were tasked with undertaking projects pertaining to the study of local climate conditions and weather phenomena. An Advisory Committee (comprising academics, public- and private-sector professionals and other members) oversees the competition.

The inaugural NWSP 2006 attracted 279 projects from 178 schools, while 234 schools collectively submitted 372 projects for NWSP 2007. The NWSP 2006 winning teams and their teacher-mentors went on a fully-sponsored trip to Australia in July 2006 to showcase their projects, while NWSP 2007 winners and their mentors showcased their projects during a fully-sponsored trip in Switzerland. The NWSP serves as a platform for local students to showcase their work internationally and exchange ideas with their peers from Singapore and elsewhere. NWSP 2009 will be officially launched on 24 July 2008 at the Science Centre.



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2006 Winners Project Showcase at Brisbane, 11-15 July 2006



Conference Students of Sustainability



Visit to Bulimba State School



Visit to Kenmore State High School



Griffith University at Brisbane South Bank

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2007 NWSP Winners at Switzerland 03-07 September 2007

Swiss Schools

KANTONSSCHULE
HOTTINGEN

KANTONSSCHULE WOHLEN
KANTONSSCHULE BADEN



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4 Water

Water is an essential input in steam generation and cooling. It is also an important component in its water treatment plant and washing of boiler.

4.1 Desalination Plant

In 2004, Senoko constructed a desalination plant of capacity 2,400 m³/day to replace PUB town water supply and to complement NEWater supply for internal boiler feedwater use. The desalination plant freed up traditional water supply for other purposes. In 2007, the volume of product water from the desalination plant reached a peak of 51,000 m³/month.



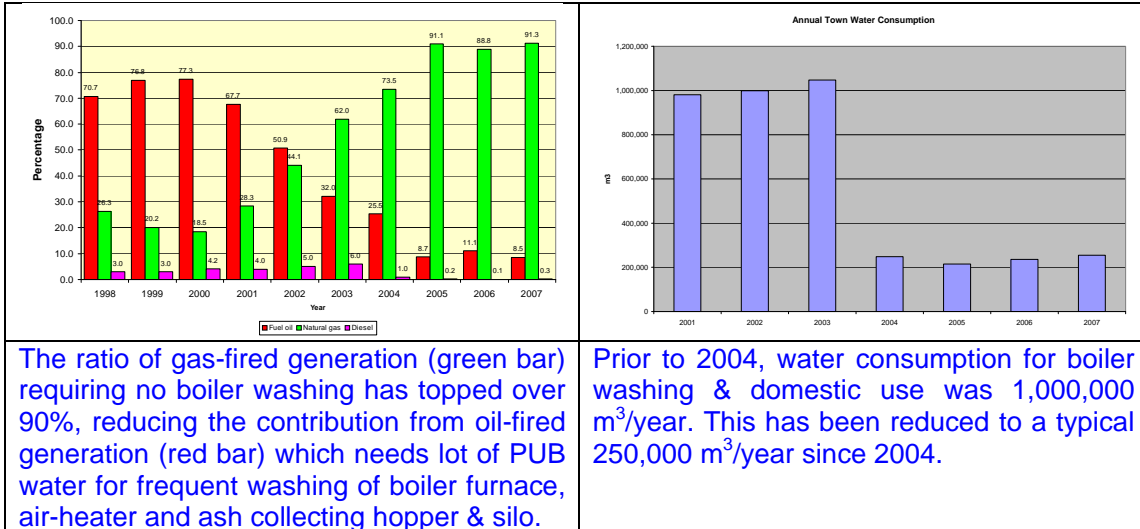
Figure 2: Senoko Desalination Plant, commissioned in 2004, makes use of triple membrane technology to provide ultra-pure product water that requires little further water treatment for boiler feedwater boiler.

No PUB town water is used in water treatment plants any more to produce de-mine water. Only NEWater and desalination water are used as feed to the water treatment plants. This cut PUB town water by 500,000 m³/year since 2004. The desalination plant allows Senoko to meet up to 80% of its industrial water requirements on its own.

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4.2 Boiler Washing

Through increasing electricity generation fuel mix of gas/oil from 75/25 in 2004 to 95/5 by 1st quarter 2008, Senoko cut down the frequency of boiler washing of oil-fired steam plants which formerly consumed 150,000 m³/year.



4.3 Protecting Singapore's Waterways

As two-thirds of Singapore will be water catchments in the long term, it is of critical importance to ensure that catchment water draining into canals and reservoirs is well managed in term of its quantity and quality.

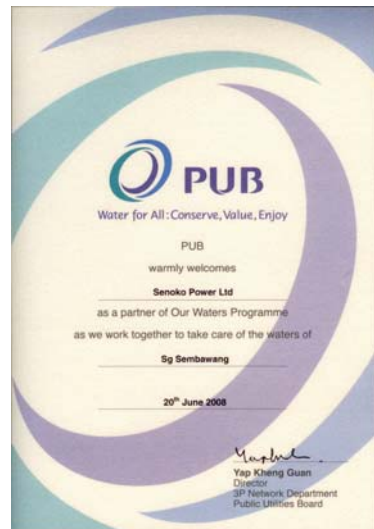
4.3.1 Adopting Singapore Waterway

In response to PUB campaign on water conservation code named My Water, Senoko officially adopted 2.5km Sungei Sembawang for a period of at least 2 years from June 2008. The idea is to play an active role in caring for Singapore's waterways, reservoirs and reservoir parks.

Invitations were sent to the following 10 schools to join in the adoption:

- Canberra Primary School
- Endeavour Primary School*
- North View Primary School*
- Peixin Primary School*
- Sembawang Primary School*
- Wellington Primary School*
- Canberra Secondary School
- Naval Base Secondary School*
- Sembawang Secondary School
- Woodgrove Secondary School*

(*schools confirmed joining in adoption as at 8 Jul 2008)



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These schools can then play an active role in preserving its waterways through activities such as litter clean-up and distributing brochures to the neighbourhood to support PUB's promotion on water ownership to conserve, value and enjoy water. Furthermore, these schools will also collaborate with Senoko on projects such as Teachers Work Attachment, Students Work Attachment and Clean & Green Singapore.

The following are a series of activities that had been or will be organized following the adoption:

- Litter Clean-up

Committed schools will join Senoko in its litter clean-up exercise. Waterway Watch Society will give a lecture to the students on the actual day of event. Each student will receive a T-shirt, goody bag and certificate of participation issued by Senoko. Woodgrove Secondary School and Peixin Primary School participated in the first riverside litter pick up on 21 May 2008. The next exercise on 18 July 2008 will involve Naval Base Secondary School, North View Primary School and Sembawang Primary School. Senoko will organise the same litter-free campaign along Sungei Sembawang every 3-4 months.



- Developing a brochure on Sungei Sembawang

A brochure detailing the history, the surrounding bio-diversity, the areas of attraction and the map of Sungei Sembawang is on the drawing board. Waterway Watch Society and Senoko will jointly develop it. Senoko plans to complete the brochure by September 2008.

The softcopy of the brochure will then be distributed to participating schools located at the vicinity of Sungei Sembawang. These schools will be encouraged to add on unique water conservation features and projects the school has undertaken such as litter pick-up organised by Senoko Power. Individual schools will then print the brochures with funding from Senoko. The school's students will distribute "their brochure" to their adjacent neighbourhoods to seek buy-in from the residents so that they become more aware of the activities happening and keep an eye on environment along Sungei Sembawang.

With the brochure, Senoko will approach organisations around the vicinity and encourage them to join in the adoption and participate in the activities.

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 <p>19.05.2008</p>	 <p>19.05.2008</p>
<p>At high tide level, some even try net fishing</p>	<p>The swamps on both sides of the river are home to some of the local mangroves</p>
 <p>14.05.2008</p>	 <p>14.05.2008</p>
<p>Scenic view of Sungei Sembawang</p>	<p>The park connector runs past places of Buddhist & Taoist worship</p>

- Water quality testing of Sungei Sembawang

Senoko will undertake regular water quality testing of Sungei Sembawang to track the condition of the water before its discharge into the Straits of Johor.

- Sustainable Public Waterway Adoption Scheme

Senoko will be seeking the advice of Waterway Watch Society, which has developed partnership with Senoko Power in educating the students in climate change awareness, on managing a sustainable public waterway adoption scheme.

4.3.2 Sewer discharge

To reduce the contamination of ground water by sewer water, monthly water quality test analysis is carried out by independent external laboratory since July 2007. Through this monthly analysis, Senoko was able to identify locations of seawater infiltration into sewer pipes. \$35,000 was spent to deploy CCTV system to survey underground sewer pipes in Feb-Apr 2008. Another \$80,000 was used to re-line the porous sewer pipes in May 2008. This has brought the sewer water quality to a level very much lower than the regulatory limits before discharge into public sewer.

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4.3.3 Storm Water Discharge

Oil-fired boiler washing water is collected in waste water collection lagoon. The water is treated to pH 6-9 and allowed to settle to a clear lovibond 1-5. The treated water is tested by an independent laboratory to confirm water quality meets the regulation limits. In the past, this treated water is discharged into the sea. Upon given the license to discharge into public sewer by PUB Water Reclamation Department in Jan 2008, Senoko spent \$50,000 in pipeline connection to discharge the clear used water from the lagoon into the nearest sewer system for Newater reclamation purpose. Senoko is the only power station that is paying water borne fee for all waters drawn from PUB.



Used water of boiler washing after treatment & settlement is as clear as normal domestic water (clear enough to see the bottom of the lagoon). It is discharged into sewer system only after confirmation of water quality by independent laboratory test.

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4.4 Replace Water Pond with Garden

In April 2007, Senoko replaced the maintenance-intensive water pond which measured 50m by 12m in front of the Admin Building with an aesthetic garden. The conversion minimised use of precious water to fill the pond and eliminate use of chemical agents in routine washing of pond. The \$200,000 conversion will be re-paid in 8 years time from water and chemical savings.



4.5 Rain Water Collection

Senoko intends to collect rain water from Turbine Building, Logistics Building and Admin Building. The collected water can then be used for gardening and floor washing.

4.6 Promoting Water Conservation Internally

4.6.1 Water Conservation Training for Employees and Contractors

In May 2008, Senoko conducted a series of EHS refresher workshop with strong emphasis in water conservation for all internal employees. The same workshop will be extended to all contractors in second half of 2008. Employees were alerted on the financial loss from:

- Leaky fire-fighting water mains & hydrants, and the inspection interval needed to spot leakage;
- Leaky faucet within power plants and the maintenance regime required;

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- Leaky faucet in shower rooms and toilets. A \$80,000 contract has just been awarded to renovate two shower rooms/toilets used by the contract workers with water saving devices;
- Unrestrained water use in landscape maintenance.

In addition, attendees were given thimbles collected from 3P Dept of PUB to encourage use at their respective homes in May 2008.

Using its Water Conservation Methods in regular patrols, it has significantly reduced wastage through leakages along pipes, valves and tanks.

Its Water Conservation Methods include using of water conservation devices like the constant flow regulators on its taps and faucets, and the low capacity flushing cistern. It also includes the change in cleaning and gardening methods.

4.6.2 Senoko Work Improvement Suggestion Scheme

Senoko Work Improvement Suggestion Scheme (SWISS) is now extended to include suggestion on water conservation and water sports activities. Original suggestion wins \$20 and another \$200 if the suggestion is accepted for implementation. The employee making the suggestion receives the cash even before the suggestion is implemented.

4.6.3 Water Conservation Handbook

This handbook complements the existing Environmental Handbook, but with greater emphasis on internal capacity and external capacity building information on water conservation. The handbook will be available by 3rd quarter 2008.



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5 Waste Management

5.1 Reduce existing infrastructure in multi-million projects

Senoko power plant construction projects are testimonial of infrastructure re-use. The \$600 millions Senoko Stage 1 Re-powering in 2000-2004 retained the use of prime mover foundation, seawater cooling system and electrical transformers. It saved about 15% of the cost and shortened construction by about a year. It was the first of its kind in the region. Similar concept will apply in \$750 millions Senoko Stage 2 Re-powering in 2009-2011.

5.2 Eco Action 2008 on 5 June 2008, Reducing Its Carbon Footprint

Senoko believes that if everyone can make small habitual changes to their lifestyle over a sustained period, we can make a difference.

- Public transport or car-pooling

It encouraged employees to take public transport or car-pooling instead of driving to work to reduce greenhouse gas emissions.

Its President & CEO Mr Roy Adair took the lead by riding MRT with the evening crowd to Clifford Centre for a business meeting on 4 June and will continue to do so. Similarly, a number of other employees either car-pooled or took MRT & bus to their designated places of work.

Mileage savings:

Car pooling = 76km, Bus = 11km, MRT = 79 km

Carbon savings after offsetting against routine mode of transport = 15.12kg CO₂



- Higher default air-con temperature

It has set the default air-con temperature to 25°C for all offices. This simple act resulted in:

Total Energy Savings = 220 KWh

Carbon savings = 94.60kg CO₂

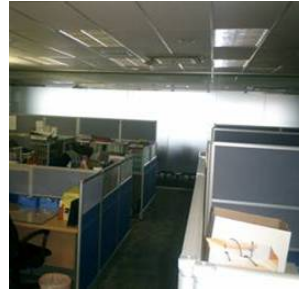


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- Switching off lightings during lunch breaks

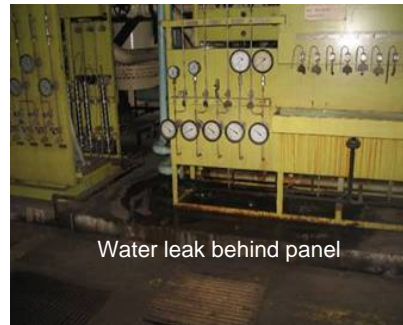
Its employees switched off all office lightings (which are already T5 energy-saving lamps) during 1-hour lunch break. As a result:

Carbon savings = 0.35kg CO₂



- Fixing water leakages

Its regular patrol allows it to spot and fix leaks at water pipes, toilet/shower room in a timely manner. Employees are encouraged to report any leakages immediately as well.



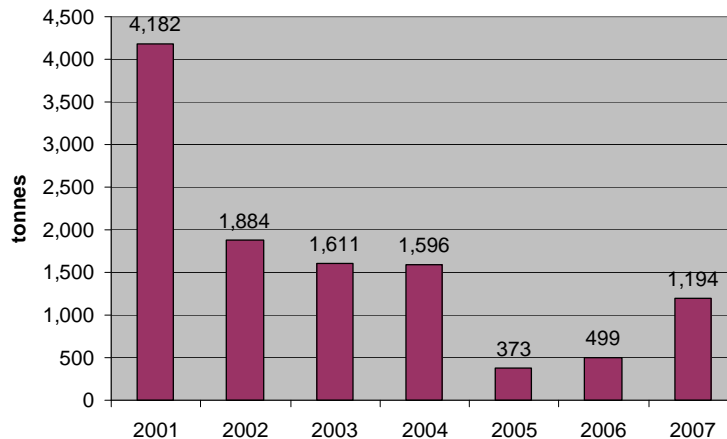
- Installation of thimble

It installed thimble in showerhead and water tap without retraction faucet to reduce excess flow.



5.3 Ash Disposal

The company optimises the use of CCPs in place of less efficient steam plants. With 90 per cent of its power output coming from Combined-Cycle Gas Turbines (CCGTs), it now produces 80% less ash. Since the ash is bound for Semakau Landfill, its use of CCPs is in line with the SGP2012 target of extending the lifespan of Semakau Landfill to 50 years.



The rise in 2007 disposal was mainly due to watery ash from settling lagoons

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5.4 General level of Reduce, Re-use & Recycle

It has implemented waste reduction, re-use and recycling programs throughout the plant. The Company engages all employees and most business partners in these programs.

These initiatives include:

- devising a segregate-and-collect system for recycling toner/printer cartridges, paper, metal, cans, bottles, electronics and electrical equipment and waste oil
- replacing the old Halon 1301 fire-extinguishing medium in its fire extinguishers with non-ozone depleting alternatives, once the Halon 1301 has been used up (about 90 per cent of the old medium has been replaced so far)
- installing gas monitoring devices and an alarm system at its switch houses, so that accidental greenhouse gas leaks can be detected and immediately looked into

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6 Public Health

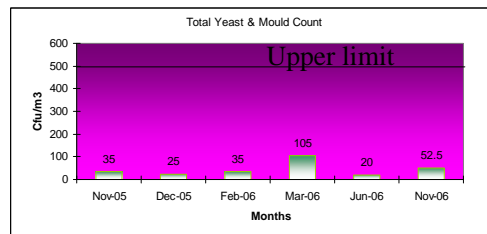
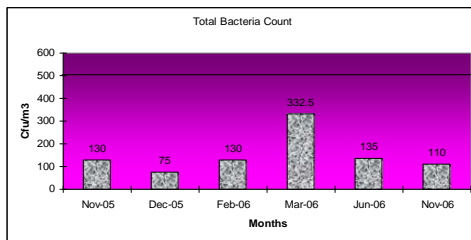
Senoko is situated less than 3km from residential areas. We are also separated from peninsula Malaysia by the narrow Straits of Johor. To maintain good relations with these neighbouring communities, it seeks to minimise pollution at source.

Senoko deploys independent EHS auditor to spot areas which may breed mosquitoes.

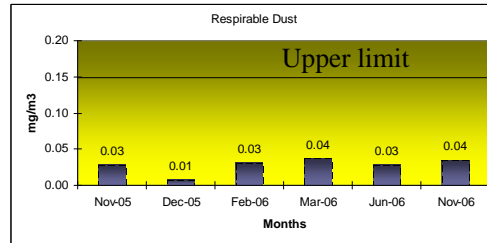
6.1 Monitoring of Air Quality

6.1.1 Indoor Air Quality

Following the 2003 SARS crisis, Senoko implemented quarterly indoor air quality checks to improve working conditions.



- The measurements show that the air quality is within acceptable limits. The studies also allow it to establish the baseline air quality during non-emergency periods.



6.1.2 Surrounding Air Quality

From July to November 2006, Singapore Polytechnic conducted an independent study of air pollutant emission levels up to a distance of 3 km from Senoko's plant. The study found that the emission level was consistently lower than that observed from shipyards, industrial premises and vehicle depots within the Sembawang, Woodlands and Yishun areas.

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6.2 Noise Control

Senoko has taken special measures to protect its staff from prolonged exposure to noise.

Wherever possible, quiet transformers, motors and fans are used. Equipment inspection and noise measurements are carried out at the manufacturers' workshop and after on-site installation, to ensure that the noise emission limits laid down by Senoko are met. Acoustic louvers and enclosures, silencers, sound absorptive linings and barriers are used wherever additional noise reduction measures are necessary.

Regular in-plant noise surveys for plant equipment are carried out to ensure that noise emission remains within acceptable limits.

7 Conserving Nature

Reserving Space for Greenery

Despite space constraints, Senoko makes an effort to reserve between 10 and 15 per cent of its premises for greenery. More land area at its plant has been converted to “green lungs”, and the fruit trees, tropical palms, shrubs and flowers that have been planted also help to improve its air quality.



Senoko has also set aside a vacant plot of land for Peixin Primary School to plant 100 bushes of Rosella. This land is above the electricity high voltage cable tunnel and has not been since 1975. Its shallow soil will be adequate for low roots bush plants.



The prepared beds are meant for Rosella saplings

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8 Industry and Community Partnerships

Senoko is a genuine triple bottom line company concerned not only with its economic performance, but also its impact on the environment and society. Hence, Senoko not only supports worthy community environmental programmes, but actively spearheaded some of these programmes as well.

By working with various parties in a host of community initiatives, Senoko has demonstrated how the private sector can raise environmental awareness among Singaporeans.

8.1 Central Data Depository

Previously, most of the mini weather stations operate in a stand-alone manner, meaning that students can only access data collected from their own schools and not elsewhere.

To address this limitation, Senoko partnered Nanyang Technological University and Microsoft to develop a system that automatically consolidates data from all the mini weather stations in real-time. This database served a wide range of useful application areas affecting the Singapore environment. For example, a research team at NTU conducted a research study on the correlation between local weather patterns and the occurrence of dengue fever.

8.2 Collaboration with Government Agencies and Schools

8.2.1 Corporate And School Partnership Programme (CASP)

Under this NEA programme, Senoko adopted 15 schools mostly in the Woodlands, Sembawang and Yishun areas. It provides attachment training opportunities for the teachers and the students, and also visits the schools regularly to understand their needs for technical expertise and sponsorship.

8.2.2 Teacher Work Attachment Programme

Under this MOE programme, teachers and students are attached to Senoko to learn how Senoko operates in an environmentally responsible manner while maintaining profitability. Some teachers and students also got the opportunity to visit its partners.

8.3 Knowledge Sharing with Community

By sharing its environmental knowledge and experiences with the community, Senoko demonstrates how the private sector could play an active role in promoting environmental awareness.

8.3.1 Knowledge Sharing with Schools

Senoko's representatives regularly deliver talks and lectures on topics such as climate change and water conservation. Examples include:

- 15 May 2008, Senoko speakers talk about water conservation to over 600 students of Primary 4 to Secondary 2 of Singapore schools at the Singapore Youth Science Festival jointly organised by Singapore Science Centre, the Science Teachers Association of Singapore and Shell Companies in Singapore
- 8 May 2008, Senoko speakers talk to over 800 students of Primary 3-6 at Paya Lebar Methodist Girls' School on water conservation & keeping waterway clean



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8.3.2 Hosting Visits from Schools

Senoko regularly hosts visitors from the education community. Example includes Federal Institute of Technology Lausanne Switzerland in September 2007, University of Hong Kong and Mahidol University of Bangkok Thailand in March 2008.

8.4 Participation in Community Environmental Programmes

8.4.1 Corporate Social Responsibility (CSR) Movement

Senoko became one of the 13 founding members of Climate-Neutral Network (CN-Net) pledged to share environmental & community programme and work with like-minded countries, cities and corporation to achieve carbon neutral footprint in the coming decades. CN Net was launched simultaneously on 21 February 2008 in Nairobi and Monaco, which was attended by a number of Environment Ministers.

Senoko became one of the event sponsors at UNEP Business For Environment at Suntec in April 2008. At the conference dinner, eight "Champions of the Earth" were recognised. These champions were political/scientific luminaries of their respective parts of the world. Senoko President & CEO Mr Roy Adair represented Senoko signed UN Global Compact 'Caring for Climate' on 23 April 2008.

8.4.2 Singapore Waters Programme

As part of its commitment to the Singapore Waters Programme, Senoko has supported several environmental initiatives conducted by Non-Governmental Organisations (NGOs).

It provides the Waterways Watch Society (WWS) with a mini weather station. WWS collaborates in Senoko Sungei Sembawang adoption programme by giving lecture to the students prior to litter pick up. Both will cooperate to produce the base draft of brochure about Sungei Sembawang to entice schools to buy-in nearby residents about water conservation programme to conserve, value and enjoy.

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8.4.3 Singapore Green Summit

Senoko Power has supported the Singapore Environment Council (SEC) since 2002 in its drive to create an improved environment for future generations of Singaporeans. It sponsors the SEC-Senoko Power Green Innovation Award (given out at the Singapore Green Summit), which recognises companies and individuals who have developed innovative and eco-friendly products.

8.4.4 Clean and Green Singapore

It is an annual event Senoko works very closely with NEA to encourage adopted schools to showcase their environmental projects.

8.5 Partnering Employees

To encourage greater environmental responsibility among employees, Senoko allows staff to claim time-off and mileage for participating in community environmental projects.

As a result of the strong support from the company, one of its staff won the Eco Friend Award in 2007.

Senoko top management had set aside funds to support adoption activities of public waterway. Senoko President & CEO, Mr Roy Adair, made a personal pitch on 22 May and 28 May to all employees to encourage internal volunteers to participate in waterway clean up.

Similarly, to encourage its employees to enjoy Singapore's waterways, the Senoko Recreation Club will be holding special talk to entice employees to take on water sports such as canoeing and dragon boat race. The goal is to see its employees participating in community water sports in 2008/09.



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9 Conclusion

Senoko Power is acutely aware it has a key role in ensuring environmental sustainability by being a solution provider. It has invested heavily in eco-friendly technologies, its staff and premises, as well as the community.

It has competent people implementing improvement programmes and appropriate control systems to respond to emerging environmental issues. It benchmarks its environmental performance against world-class utility companies. Its community-based projects are testimonial of its commitment towards a better and greener environment for present and future generations of Singaporeans. Ultimately, through these community-based projects, Senoko wants to encourage stakeholders to pool their resources together so as to promote ownership to conserve, value and enjoy its environment.

It will continue to maintain its excellent track record and build a clear leadership role in the community. For Senoko, it aims to provide the power to make a difference.



Providing the power to make a difference