## INTEGRATING SUSTAINABILITY ... AT MOUNT MANYPEAKS PRIMARY AND COOLBINIA PRIMARY SCHOOLS





Laura Bird & Elaine Lewis Futures Focus Conference 14th October 2013

# **Systems Game 1:**

Circles in the Air

Note: Some photos have been deleted from this PowerPoint because photo permission is not available for website access.

### INTEGRATING SUSTAINABILITY AT







- Defining sustainability?
- Introducing Airwatch as a sustainability tool for schools.
- Airwatch Activities.
- How it has been embedded at Mt Manypeaks.



## SUSTAINABILITY DEFINITIONS

- Sustainability = the ability of any system to keep going
- "Enough, for all, forever"
   (World Summit for Sustainable Development, 2002)
- "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."
   (Our Common Future - The Brundtland Report, World Commission on Environment and Development, 1987)



EDUCATION FOR SUSTAINABILITY PROCESSES

- 1. Envisioning a better future
- 2. Critical thinking and reflection
- 3. Participation
- 4. Partnerships for change
- 5. Systems thinking
- 6. Transformation & Change
- 7. Education for all & lifelong learning Source:

http://www.aries.mq.edu.au/about/educatio n\_forsustainability\_processes



## HOW DOES SUSTAINABILITY WORK?

Sustainability operates from 3 interconnected dimensions:-

Environmental protection + Social equity + Economic prosperity Under a Governance of Corporate Social Responsibility



http://www.energyeducation.tx.gov/energy/section\_ 3/topics/conserving\_in\_the\_community/c.html

## UNDERSTANDING ENERGY

Where does electricity come from?



The Grid Power Plant Coal

Energy for the future (utube 20 min) http://greennovate.org/energy-for-the-future

### MAKING CO2 VISIBLE TO STUDENTS



 Black Balloons - greenhouse gas (utube 49 sec)<u>https://www.youtube.com/watch?v=gcM</u> <u>NZuelyNI</u>

## EFFECTS WHEEL



## HOW WE APPROACHED THE AIRWATCH PROGRAM

First task: Note down the schools energy usage by taking readings from the school's metre box every day for two weeks.



# **RECORDING METRE READINGS**

Week One electricity reading

Monday Date:	•	Meter reading (kWh)
Time	9 00am	
	3.00pm	· · · · · · · · · · · · · · · · · · ·
Tuesday		Meter reading (kWh)
Time	9.00am	
	3.00pm	
Wednesday		Meter reading (kWh)
Time	9.00am	
	3.00pm	
Thursday		Meter reading (kWh)
Time	9.00am	
	3.00pm	
Friday		Meter reading (kWh)
Time	9.00am	· · · · · · · · · · · · · · · · · · ·
	3.00pm	

## AUDITING THE SCHOOL'S ELECTRICAL USES

Room Name:			Collection Date:		Collector's name:		
Appliance	Watt (W typical)	Number of appliances	Estimated running time	Energy (Watt hours Wh)	Energy use per day (kWh)	Cost per day set at 20c KWh	Average cost per school week
Light globe	40	0	0	0	0	\$.	\$ -
Light globe	60	0	0	0	0	\$-	\$ -
Light globe	100	0	0	0	0	\$ -	\$ -
Lamp		0	0	0	0	\$ -	\$ -
Fluorescent tube	36	0	0	0	0	\$ -	\$ -
Fluorescent tube	20	0	0	0	0	\$ -	\$ -
TV	200	0	0	0	0	\$ -	\$ -
Computer	150	0	0	0	0	\$ -	\$ -
Laptop	25	0	0	0	0	\$ -	\$ -
Fan	70	0	0	0	0	\$ -	\$ -
Electric radiator heater	1700	0	0	0	0	\$ -	\$ -
DVD	100	0	0	0	0	\$ -	\$ -
DVD (standby)	5	0	0	0	0	\$ -	\$ .
Printer	50	0	0	0	0	\$ .	\$ .
Air conditioner	220	0	0	0	0	\$ -	\$ -
Smart board	15	0	0	0	0	\$ -	\$ -
water boller	1500	0	0	0	0	\$ -	\$ -
outside lights		0	0	0	0	\$ -	\$ -
elect this number and right dick, select insert,	or insert row.	0	0	0	0	\$-	\$ .
		0	0	0	0	\$ .	\$ -
		0	0	0	0	\$ .	\$ .
		0	0	Ó	0	\$ -	\$ -
Totals		0	0	0	0	\$-	\$ -

## USING AN ENERGY METRE

To work out the wattage of appliances students got to use an energy metre.



## **MMP WEEK 1 DATA ENTERED**



Graphs:Week one electricity consumption

#### Week One electricity readings

Monday	date:	ENTER DATE	Meter reading (kWh)	Totals	Total energy use 24 hours
Time	9.00am		7375		
	3.00pm		7404		10095
			Total school day	29	90
			Total overnight	30	
			Total 24 hrs	59	
Tuesday	date:	#VALUE!	Meter reading (kWh)	Totals	₹ 70 to to to to
Time	9.00am		7434		2 (0 59 58 57 57 57 57 57 58 57 57 57 57 57 58 57 57 57 57 57 57 57 57 57 57 57 57 57
	3.00pm		7464		
			Total school day	30	
			Total overnight	28	ž <sup>40</sup>
			Total 24 hrs	58	ž 30
Wednesday	date:	#VALUE!	Meter reading (kWh)	Totals	å 20
Time	9.00am		7492		
	3.00pm		7521		10
			Total school day	29	
			Total overnight	25	Monday Tuesday Wednesday Thursday Friday + Weekend
			Total 24 hrs	54	Days
Thursday	date:	#VALUE!	Meter reading (kWh)	Totals	
Time	9.00am		7546		
	3.00pm		7573		
			Total school day	27	
			Total overnight	30	BASELINE DATA
			Total 24 hrs	57	Carbon dioxide emissions per week 313
Friday	date:	#VALUE!	Meter reading (kWh)	Totals	Amount of black balloons 6,266
Time	9.00am		7603		Black balloons per student 216
	3.00pm		7625		Electricity use per student (kWh) 11.1
			Total school day	22	
Weekend	date:	#VALUE!	Meter reading (kWh)	Totals	]
Friday 3pm- M	onday 9am		Total weekend	95	How many students are in the school? 29
					Things we noticed this week? Including weather and temperature?
Week Or	ne electr	ricity cons	umption total		
THEOR OF		icity cons			
			323	kilowatt hours	

## MMP WEEK 1 GRAPHS





Graphs:Week one electricity consumption





Total Tallies: Week one electricity consumption

	Electricity consumption (kWh)
Day	Total per school day
Monday	29
Tuesday	30
Wednesday	29
Thursday	27
Friday	22

	Electricity consumption (kWh)
Day	Total overnight
Monday	30
Tuesday	28
Wednesday	25
Thursday	30
Friday	NA

	Electricity consumption(kWh)
Day	Total 24 hours
Monday	59
Tuesday	58
Wednesday	54
Thursday	57
Friday + Weekend	95

# STUDENT ENERGY CAMPAIGN



# MT MANYPEAKS PS RESULTS

The students achieved a fantastic 16% reduction in energy usage over their 3 week campaign.

Involved collaboration with:

- Students,
- Teachers
- Staff

### NEXT STEP SOLAR PANELS



## HOW IS SUSTAINABILITY RELEVANT TO THE CURRICULUM?

- Mathematics: Students measure and monitor energy use; use statistical analysis to help inform decision making and actions for the future.
- Science: Students develop an understanding of the interconnectedness of the earths biosphere, geo-sphere, hydrosphere and atmosphere; understanding the variety of sources of energy, and the consequences of using different types of energy.



- English: Students investigate, analyze and communicate ideas and information related to sustainability to advocate, generate and evaluate actions for their schools sustainable future.
- History: Students understand worldviews that form our judgments towards our use of the earth's resources, and identify the historical significance and the roles played by individuals and communities in protecting environments.
- Values; The students develop and value collaboration. For real change in energy use to be created the students have learnt to communicate and collaborate with the staff of MMPPS.

## IN SUMMARY

### Australian Curriculum Links:

	•	
SCIENCE	Science as a Human	Nature and Development of Science, Use and Influence of
	Endeavour	Science
	Science Inquiry Skills	Processing and Analysing Data and Information, Planning and
		Conducting, Communicating.
	Science Understanding	Physical Sciences
ENGLISH	Language	Expressing and Developing Ideas
	Literacy	Interacting with Others, Creating Text.
	Geographical	Place and liveability (yr 7)
GEOGRAPHY	Knowledge and	Environmental change and management (yr 10)
	Understanding	

# WHERE TO FROM HERE?

Airwatch website

http://education.dec.wa.gov.au/airwatch.ht ml

Sustainability Hubs

http://www.swinburne.edu.au/ncs/efshub/c lassroom.html

 What would help you as teachers to embed sustainability into your delivery?

# **100 Tonne Target:**

Whole Systems Thinking in Education for Sustainability



**Dr Elaine Lewis** 

# Outline

- CCP
- AuSSI WA
- Embedding Sustainability
- 10, 50 & 100 Tonne Plans



# Sustainability

- Ongoing capacity of Earth to maintain all life.
- 3 organising ideas
   > Systems
   > World views
   > Futures



Key words
Knowledge
Skills
Action





# 2012 Coolbinia PS Ecological Footprint: Whole School Input

**50 TONNE PLAN** Transport & Air: BIO-DIVERSITY ANSPOR Cycle/walk to School Day; PURCHASING & WASTE Walking School Bus; Travel VATER Smart & Airwatch programs; Bike Ed. **Energy**: 10 Tonne Plan action & solar lanterns for Uganda; Solar lego & power (panels): energy efficient fridge in Canteen; skylight; sun dial; window tinting; turn off computers & cord switch; turn off lights & open windows; power down ranger. All the ways in which our Water: school is reducing our Waterwise school; S&E and Science

FCOLOGICA

OTPRIN

curriculum; bore water; excess

watering cans; worm whiz.

water on plants; dual flush toilets;

Australian Sustainable Schools Initiativ **Biodiversity:** Orchard & veg garden; worm farming & incursion; hanging baskets & planters; composting; Science - fungi forays, endangered animals, frog habitat; Bush care, walk & planting days; Market Day; National Tree Day; Zoo Fodder garden; Bokashi bucket, Council of All Beings program; fish tank; Tuesdays Cool School Adventurer club & Thursday Science club.

### Purchasing & Waste: LGS;

Wastewise school; re-use paper; battery/phone/paper/cardboard/ink cartridge recycling; SITA waste All the ways in which our school is reducing our ecological footprint jigsaws; recycled cable reels as garden tables: recycled fridges as

garden tables; recycled fridges as worm farm; junk to create artworks; recycling puppet show; Clean up Aust. Day; Nude lunches.

### 2012 Coolbinia PS Social Handprint: Community Partnerships: Schools – ECUA, Sir David Brand, MLSHS, Whole School Input St Pauls; Organisations – Maia Maia Project, Whole School Input

ANNUNT PARTY

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STUDENT WELLBEING

St Pauls; Organisations – Maia Maia Project; AAEE-WA, Perth Zoo, DEC, Rotary; Water Corp., Coolbinia Bushcare group, Everlasting Concepts, RSL, Anglicare, Bunnings, RSPCA; Market Day; IYV + 10 Celebration & Parent Forums; P & C; KPP Committee; Canteen; School Council; Anzac Day; COSCA; electronic Newsletter/ website; work experience programs; Constable Care program.

### Cultural & Social Diversity:

Music program; music & farm animal incursions & ed program; LOTE – Italian; Book Week celebrations; sport programs; fundraising events; cultural dress & food; International College of Educ, Sir David Brand, MLSHS.

### Indigenous Culture:

Acknowledgement of Country at official functions; Indigenous art; bush tucker; traditional lifestyle using natural resources for survival; growing native plants; Wadumbah Dance Group; NSWk Science incursion; selling 'respect' wrist bands.

# CULTURAL AND SOCIAL DIVERSITY

### SOCIAL HANDPRINT

All the ways in which our school is increasing our **social handprint** 

### **Built Environment:**

10 Tonne Plan; SAKG kitchen garden program; Yr 7 pizza oven; veg gardens & orchard; Canteen; grants for new gardens & frog habitat; grant for garden sign with recycled materials; utilising computer & digital projector (reduce paper); IWB & ICT PLs ; recycling programs; bore water; photocopy limits; re-using interior equipment, bricks & limestone.

### **Student Wellbeing:**

Cool School Adventurers; Youth Congress Yr 6 /7 leadership team (frogs & garden);TravelSmart Yr 6 Leadership team; Phys Ed & sport programs; daily fitness program; interschool carnivals; cross country; cycle/ walk to school day; Tribes school & anti-bullying policy; antibullying puppet show; Yr 7 fete; resilience activities; mentors & volunteers; healthy food promotion and Crunch & Sip.

# **Eagle Eye Model**

### for teaching EfS from a whole systems thinking perspective

*Flying over* to view the big picture ... *swoop in* to focus on a narrow aspect of 'water' ... then *swoop out and over* to understand interrelationships and interdependence between other systems



# **Embedding Sustainability**

- All year levels: Biodiversity & Social Handprint
- Yr 4: Waste
- Yr 5: Water





- Yr 6: Air & Transport
- Yr 7: Energy

# $10 \rightarrow \!\! 50 \!\rightarrow \! 100$ **TONNE PLANS:** Thinking wholistically with measureable outcomes



# AuSSI



Aim: Reduce emissions of Greenhouse Gases to the atmosphere by 10 tonnes



Whole systems thinking is a framework for understanding phenomena as an integrated whole and recognising inter-connections.



The Upside Down Thermometer (UDT) acts as a wonderful visual aid in helping children see the effects of their positive actions, translating the reduction of greenhouse gases into a reduction in the Earth's temperature. The concept behind the UDT was developed by the children of Coolbinia Primary School in Perth, Western Australia. In the school's 10 Tonne Plan, as each tonne of reduction is achieved, a can is removed and the associated reduction in the Earth's temperature is noted as a real and achievable goal.

Famto celsius

5000

10000

15000

25000

00

30000

35000

10.000

45000

20000

Tonog

COLE

# Calculating:

The left hand scale shows how many tonnes of greenhouse gas the school has kept out of the air, through e-waste recycling (the money from which is sent to Solar Sister for the purchase of solar lamps), planting trees, using solar energy, being waste wise, and many other actions.

The increments may only be small, but Climate Change is caused by everyone polluting a little bit at a time. Children are made aware of the immense scale of the endeavour but persist knowing that their actions do translate into measurable change. "Do you think each of us can change the temperature of the whole earth?!!! Yikes!!! Greenhouse gases added to the atmosphere have been shown to cause the heat captured by the Earth to increase. Scientists have developed a formula relating a certain weight of these gases to the temperature of the planet. The Upside Down Thermometer shows us how much we, as a school, have turned down the thermostat on the globe from what it would have been if we had not done those things."

From the Themometer:

The right hand scale shows the change in the temperature of the Earth in femtocelsius (1/quadrillionth of a degree Celsius) resulting from each tonne of carbon reduction.



Maia Maia - Solar Sister Light for Carbon Exchange *The atmosphere connects us all* 

# Calculating ... our 10 tonnes



Global warming prevention achieved by the following activities:

Activity	CO2-e/#	#	t CO2-e	Boya
Recycling aluminum	0.991kg/kg	110 kg	0.01	10
Recycling paper/cardbo	ard 2.52kg/kg	1000 kg	2.52	252
Solar lantern abatemen	t 0.1409t/lantern/	/yr20 lanterns	2.82	282
Rainwater tanks	1kg/kL	100 kL	0.100	10
School Solar panels	0.82kg/kWh	3650 kWh	2.99	299
Composting/Wormfarm	0.945kg/kg scra	ps 1500 kg	1.41	141
Recycling coffee ground	ds 0.945kg/kg sc	raps 1500 kg	1.41	141
Recycling lawn clipping	s 0.945kg/kg scra	aps 1500 kg	1.41	141
Tree planting	7kg/seedling	1000 seedlings	7	700
Walking school bus	0.271kg/kid-km	1000 kid-km	0.27	27
Household Solar Panels	s 0.82kg/kWh	5000 kWh	4.1	410
Power bill reductions	0.82kg/kWh	2000 kWh	1.64	164
Carbon reserve				-500
Totals			~15 tonne	1000 B

### AIRWATCH PROGRAM TOTALS

Pre campaign	2,556	kWh
Post campaign	2,035	kWh
energy saving	521	kWh
CO <sub>2</sub> reduction	506	kg
Cost savings	\$ 104.24	

### Overall energy reduction:

20%



# **School Solar Power**

### http://www.allsolus.com.au/monitoring.aspx





# Acknowledging:

The story, the symbolism, the significance.

The Serial Number of each note is calculated to represent the amount of temperature reduction achieved by removing the equivalent of 10 Kilograms of CO,



Maia Maia was gifted the name of BOYA by a traditional Australian Elder. A "Boya" is a stone used in trade among indigenous Australians for necessities like water rights.



The purpose of the Boya is to tell the story of a community, it's efforts and engagement in aiding the environment. Each Boya issued signifies the success of their project, of goals attained. And as the Boya circulates through the wider community the story is told and retold. The message spreads like ripples in a pond. The QR (Quick Response) code gives instant access to rich online content via hand held devices such as touchpads and smart phones it can link directly to the story of each Boya.



Maia Maia logo -The Shell is making our home by capturing carbon, the encompassing hands are community, households and business working together. Maia Maia means 'home' or shelter in the local Nyungar language similar to Eco in latin.

The face of the note depicts a dynamic background featuring wave and wind energy. There are symbols denoting solar,





Maia is the the eldest sister of the Pleides and has a significant role in Greek mythology.

The Seven Sisters (Pleiades) similarly also figures in the Dreamings of Indigenous Australian cultures. We have used this inverted view which is how the Pleides has been depicted in the southern hemisphere for thousands of years.

The atmosphere connects us all

## **Trading Boyas**





# **50 TONNE PLAN**

Aim: reduce emissions of Greenhouse Gases to the atmosphere by 50 tonnes (CO2 equivalent global warming prevention)



Vegie gardening





Recycling



Worm farming



Tree planting in bushland

# Partnerships

### 50 Tonne Plan partner in 2012: Sir David Brand School



# Actions:

Linking all aspects of eco footprint and social handprint



Solar Sister, based in Rhode Island, USA, purchases solar lamps for families in its Girl Empowerment program in Uganda. The lamps replace kerosene lanterns, allowing girls to study at night, resulting in improved literacy rates and a reduction in climate change

Money raised by 10-Tonne Plan initiatives in Australian schools is sent to Solar Sister. The related greenhouse gas reduction is tracked using the Upside Down Thermometer as a visual aid - which translates carbon reduction to change in the Earth's temperature.

AR UNIT HIS

Maia Maia - Solar Sister Light for Carbon Exchange

The atmosphere connects us all

# Conclusions

What worked?:

- > 10 & 50 Tonne Plans achieved goal in 1 yr
- Upside Down Thermometer effective tool
- Demonstrated whole systems thinking in a school
- Involved whole school community
- Supported by grants (DEC/Waste Authority, SEA)
- First boya issue in a school model for other schools
- ➢ Other schools have Plans e.g. Churchlands PS 20 TP
- ➢ Research
- ➢ Now 100 Tonne Plan



# **Outcomes for Today**

- Demonstration of application of Sustainability as a CCP
- Introduction to Whole Systems Thinking
- Introduction to 10, 50 & 100 Tonne Plans
- Review of how 100 Tonne Plan is embedded into AC



# Systems Game 2: Triangles

# Whole systems thinking in EfS Questions please...