

# The Chippendale Project: a new road design for Australia



**Damage caused by roads: bicycle tyres and wheels melted by the road-boostered Melbourne heatwave, 2009**

# Project goals

**Build a demonstration road that will cool our cities, grow our food, and grow conversations in our streets by 2009**

**Use the project to create a new design template for Australian roads by 2010**

**Design solutions that may become business as usual as they are affordable within existing road and park budgets of Councils**

# Problems

## Roads:

- Heat our cities at twice the rate of climate change because of black tar, dark roofs and no tree cover
- Increase mortality from heat - Melbourne's heat deaths were twice the number of those killed in the '09 Victorian Bushfires
- Increase business and living costs for air con
- Are 'killing" Main Streets of Australia by driving patrons to cooler air conditioned shopping centres eg Glebe Point Road, Broadway
- Decrease efficiency of electricity grids by up to 15% and increase use of water in power generation
- Cause efficiency losses in the electricity grid that cost suppliers and consumers over several hundred million dollars a year

# Solution

- Use pale tar, pale roofs and plant trees to shade over half the road surface
- not applied in this project yet but proven elsewhere to cut temperatures by 6 - 10 degrees compared to suburbs without cool, green roads

# Problem

Food costs and food scarcity are increasing eg in two of the last three years Australia had to buy wheat on the world market to meet its sales agreements - rising food prices partly reflect rising scarcity

## Solutions used in this project

- Grow food where we live and work, including on roads
- Harvest, store and absorb over 50% of rainfall where it falls on roads, preferably 80% to restore natural flows
- Stop over 4 million litres of stormwater entering Sydney Harbour
- Grow over 5% of citrus and herbs in the streets
- Cut food miles by over 5000 k a household or over half a million kilometres for the 50 households
- Grow conversations in the streets
- Grow community gardening skills

Black roads = 50 degrees  
 Old black roads = 46 degrees  
 White roads = 32 degrees

**FRESH ASPHALT**  
 REFLECTIVITY: 5%  
 TEMPERATURE: 123°F

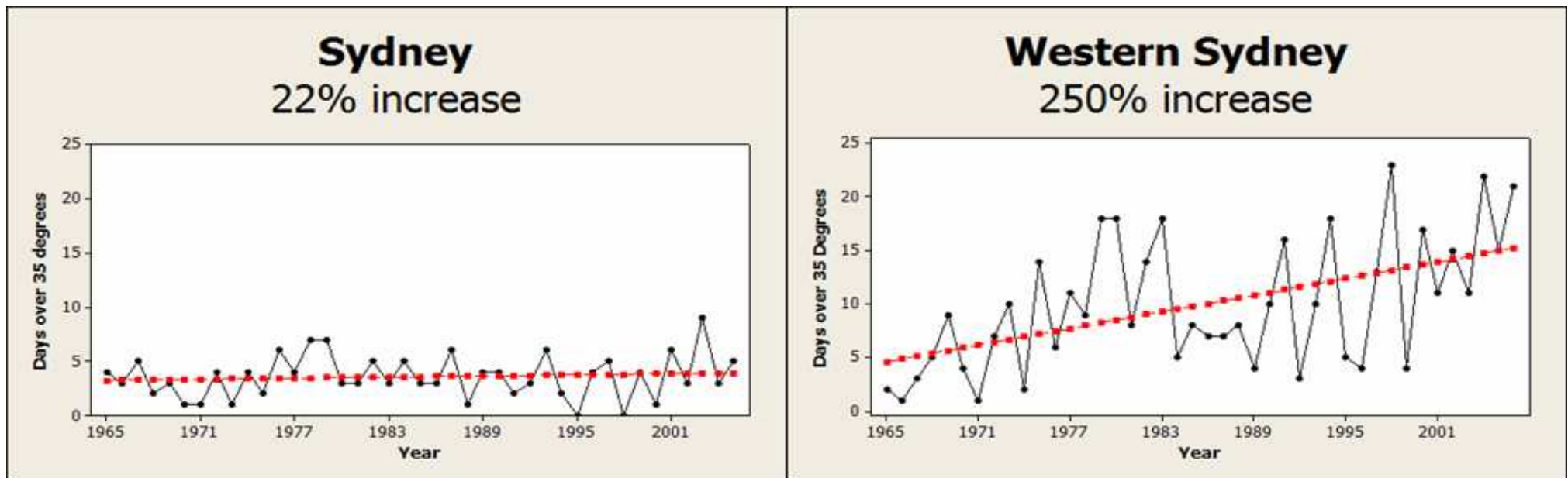
**AGED ASPHALT**  
 REFLECTIVITY: 10%  
 TEMPERATURE: 115°F

**PROTOTYPE  
 ASPHALT COATING**  
 REFLECTIVITY: 50%  
 TEMPERATURE: 90°F



# Western Sydney 5 - 10 degrees hotter because of roads, no trees, dark roofs

Number of very hot (above 35C) days per year:



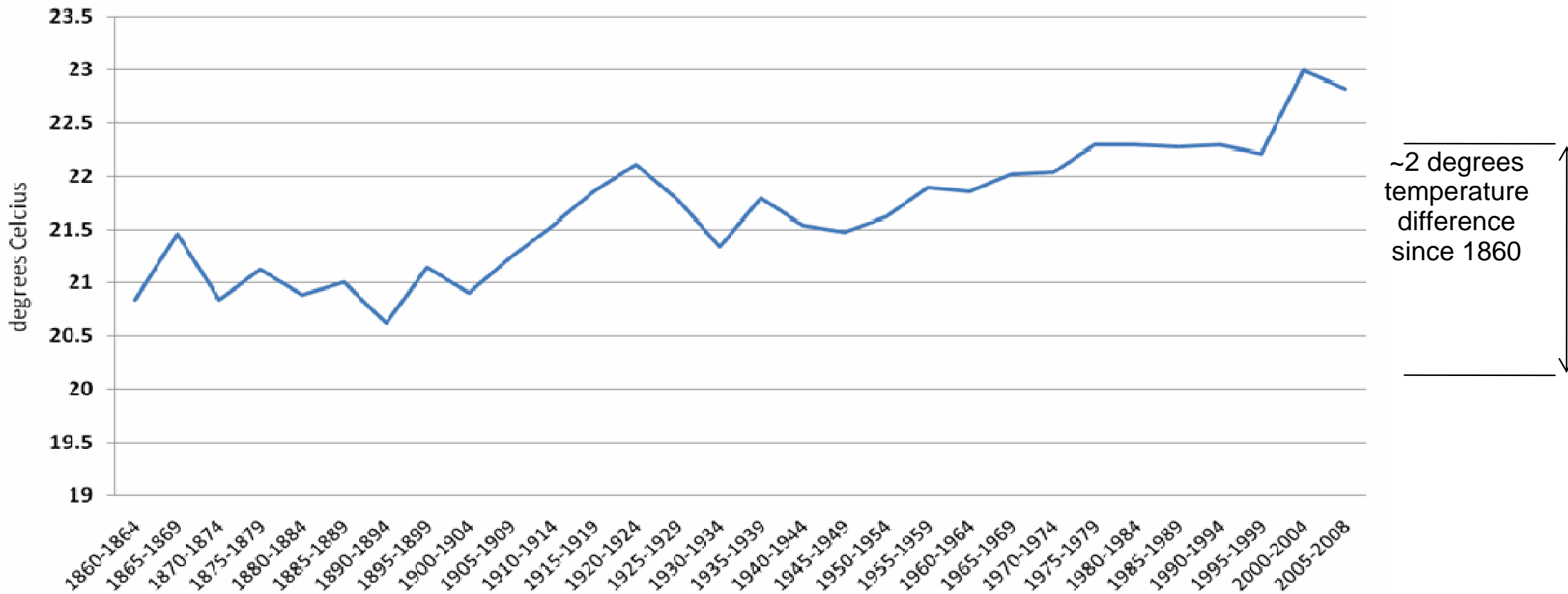
Greening Australia: The Urban Heat Island Effect and Western Sydney

## Roads make electricity grid inefficient, increase load on power stations and city buildings

1. A one degree increase in temperature on a hot day can increase the load of the grid by 120 MW
2. The generation efficiency of power stations (the amount of electricity generated per unit of fuel used) decreases with higher ambient air temperatures and their requirements for cooling water increase
3. The distribution system has up to 15% less load carrying capacity in summer than winter due to high ambient temperatures and higher demand. This leads to a higher risk of equipment failure, often lower quality of supply and shorter equipment life

# Roads increased temps 1 in 160 years Climate change increased temps .5 degree

Average Maximum Daily Temperature



Michael Mobbs Sustainable Projects, drawn by Elsa Dominish 2009



# Black roads increase street light power use and energy bills

- ⑩ In 2008 Sydney Councils paid EnergyAustralia more than \$36m for street lighting network charges and another \$6m in energy charges
- ⑩ RTA roads run up similar bills and create similar energy needs

Pale roads cut street light bills and pollution by up to 30%

# Location of road gardens



**Black roads take up ~ 27% of Chippendale**

**Area of black road in project: 2606 m<sup>2</sup>**

**Area of gardens: 651 m<sup>2</sup> = ~ 4 terrace blocks**

**Area of roofs draining to road: 3700 m<sup>2</sup>**

**Number of houses: 120 in 3 city blocks**

# Use over half the rain where it falls but:



Typical Australian design presently wastes all road water:

- ⑩ grates prevent watering of road garden and trees, wastes water and pollutes the harbour
- ⑩ trees and gardens planted above road so road water cannot nourish them

# Solution (partial) : water trees from rain on roofs and pavements



Dig up and completely expose the drainpipe below the street verge



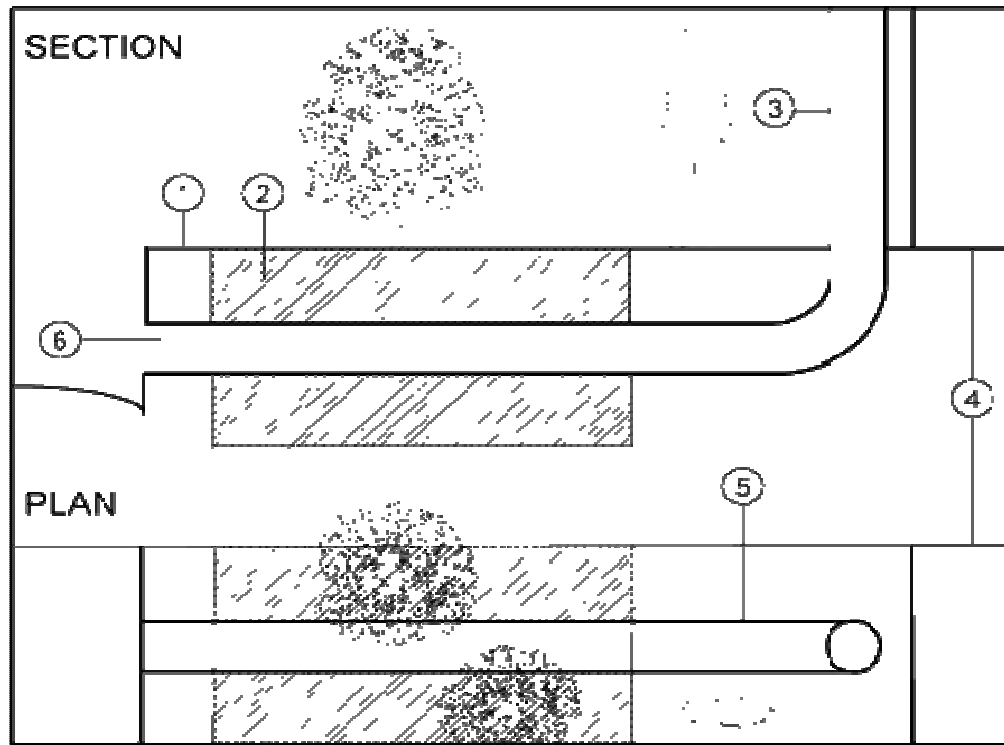
Remove the pipe then drill closely spaced holes along the base of the pipe (about 2cm apart)



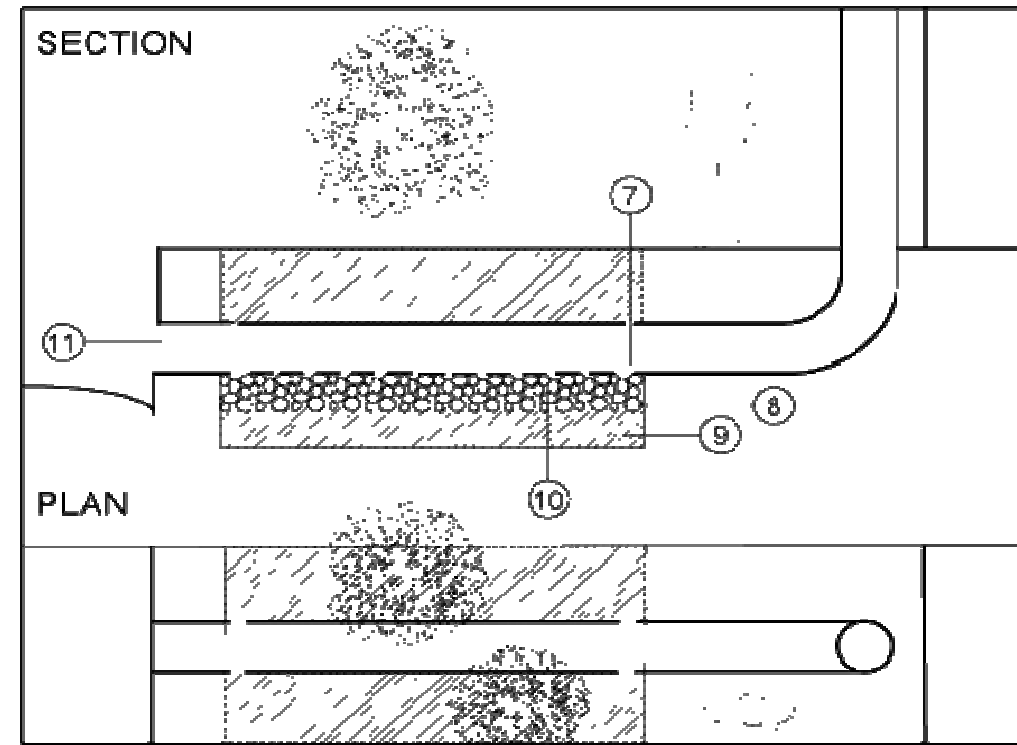
Replace the pipe leaving gaps at either end to slow down and absorb rain water at the ends

# Leaky drains now water trees

BEFORE



AFTER



NOT TO SCALE

michael mobbs sustainable projects, drawing by elsa dominish, 25/09/08

## Stop 4 millions litres of polluted stormwater entering Sydney Harbour for less than \$100 capital costs

- About 800 m<sup>2</sup> of road gardens are now watered by rainfall from the front roofs of houses.
- Roofs: 3000 m<sup>2</sup> (120 houses x 25m<sup>2</sup>)
- Street gardens: 800m<sup>2</sup>
- Total rain harvesting area: 3800m<sup>2</sup>

A Chippendale-wide project (500 houses) would keep over 10 m litres of water from polluting Sydney harbour for a capital cost of less than \$5,000 and \$nil maintenance

## October 09 - a big step



**Food for the Future Fair, Oct 2008. Planted 200 fruit trees and edible plants.**

# Grow soil from wasted food



Slab to hold up to 350 kg of compost



Slotted drainpipe - catches runoff from pavement and mixes it with compost to carry it along pipe



Slotted pipe and Aerobin



Washing up cloth to exclude soil, reused potting tray below



Cut off hose taking compost liquid into slotted pipe



Mulch over slotted pipe and gravel and rocks



Inside of newly commissioned Aerobin



Offerings by local believers



# Cut business costs and pollution



Presentable to inner city eyes



Walk on it and never know



Signs for the local Galahs

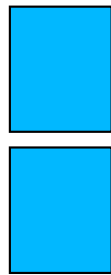


Security settings to determine how attachments are handled. View downhill of plants to be irrigated with compost nutrients.

Each year each of the four public compost bins:

- Keeps three tonnes of food waste out of garbage trucks and dumps
- Makes one tonne of soil
- Stops one tonne of carbon and methane pollution
- Takes one tonne of carbon pollution out of the Earth's atmosphere

# Garbage collection systems increase food miles and pollution by at least 200 k per load / > 1 tonne eg Eastern Creek



1 trip to collect + 1 trip to take away = 2 trips ~ 100 k

+

1 trip to collect + 1 trip to take treated waste away = 2 trips ~ 100 k

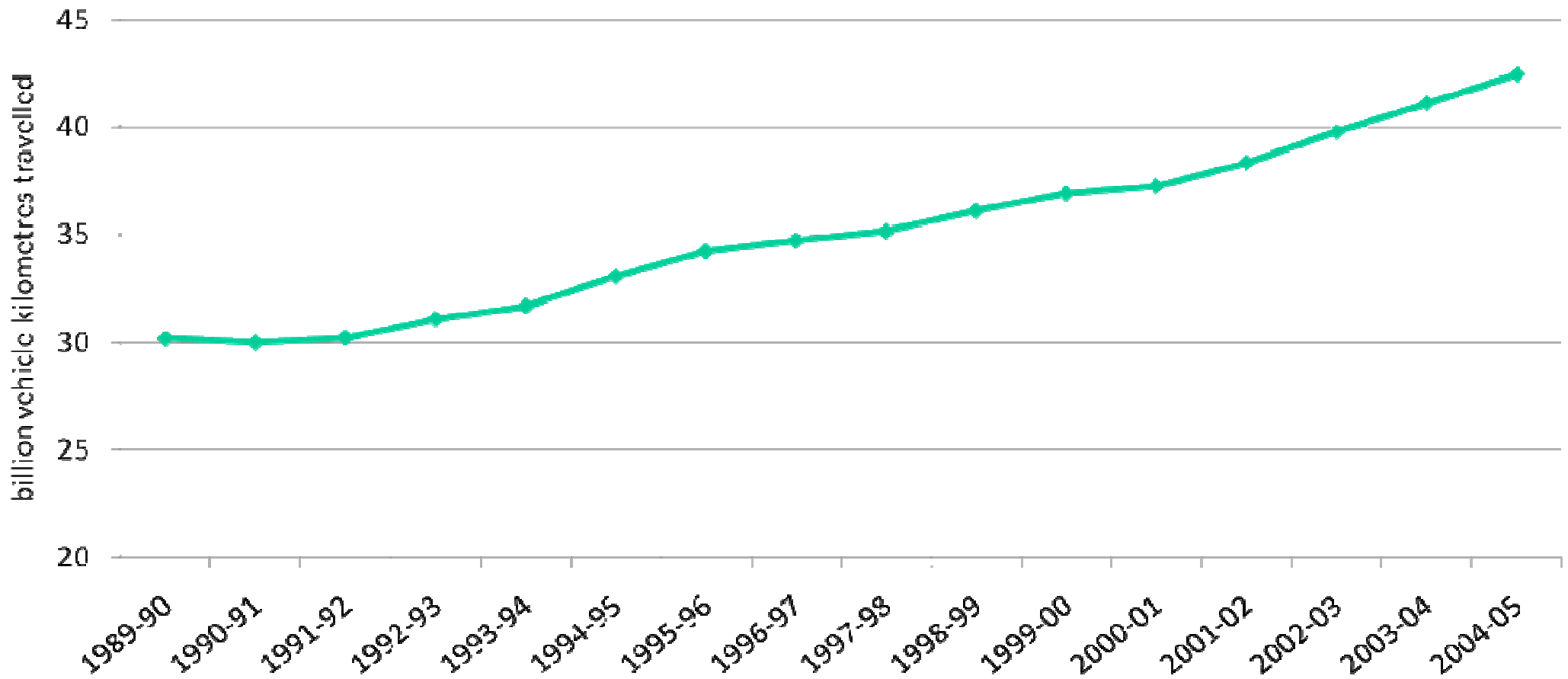
+ no decrease in garbage or collection costs

## Chippendale Project decreases garbage

- Use existing food delivery system = No food garbage, no capital
  - Backload farmers' and providores' trucks
  - Use waste food to return nutrients to farms, gardens

# Sydney travels 42 b kilometres a year, and of that about 15 b kilometres is for food

Billions of kilometres travelled in Sydney



# Café Guilia has cut all its food waste from 800 patrons a day, and cut almost all of its garbage for \$nil



Coffee grounds ready for backloading by providore, and to local compost bins

# Achievements in 18 months

- Road gardens built by residents and businesses for ~ \$4,000 + ~ \$3,000 from council
- Six folk trained to maintain public compost bins
- Value of resident and business maintenance labour @ \$20 an hour over \$5,000 a year
- Over 1,000 fruit trees and plants planted, about 30 trees and several dozen herbs stolen or broken by local human Galahs
- Stopped over 4 million litres of stormwater entering Sydney Harbour each year - at a cost of less than \$100
- Grow over 5% of citrus and herbs needed by about 150 households by 2011
- Cut food miles by over 5,000 k for every harvesting house
- Grow conversations in the streets - several blogs, facebook pages and many local stories
- Grow community gardening skills
- Ⓞ Conducting possibly the first public trial of composting - four x 400 litre compost bins
- Ⓞ Trialled and proven a way to water street gardens with roof water at a one-off cost of less than \$5 per house
- Ⓞ Trialled a way of diverting compost liquid nutrients below ground to irrigate the citrus and road gardens at a total cost per bin less than \$10
- Ⓞ Kept over 12 tonnes of food waste out of council tips, prevented over 3 tonnes of greenhouse pollution
- Stopped over 4 million litres of rain water leaving our streets to pollute Sydney Harbour for a total one off capital cost of less than \$200 and no maintenance costs

