

# GREEN ROOFS



IMAGE COURTESY OF  
CITY OF SYDNEY



# INTENSIVE GREEN ROOF

## Melbourne



# INTENSIVE GREEN ROOF New York



# EXTENSIVE GREEN ROOF

Japan



# EXTENSIVE GREEN ROOF

Ford Motor Plant, Michigan



# BENEFITS OF GREEN ROOFS

- Climate Change Adaptation
- Energy Balance and CO<sub>2</sub> Reduction
- Urban Heat Island Effect and Indirect Energy Savings
- Amenity
- Stormwater Attenuation
- Mixed Bag of Others

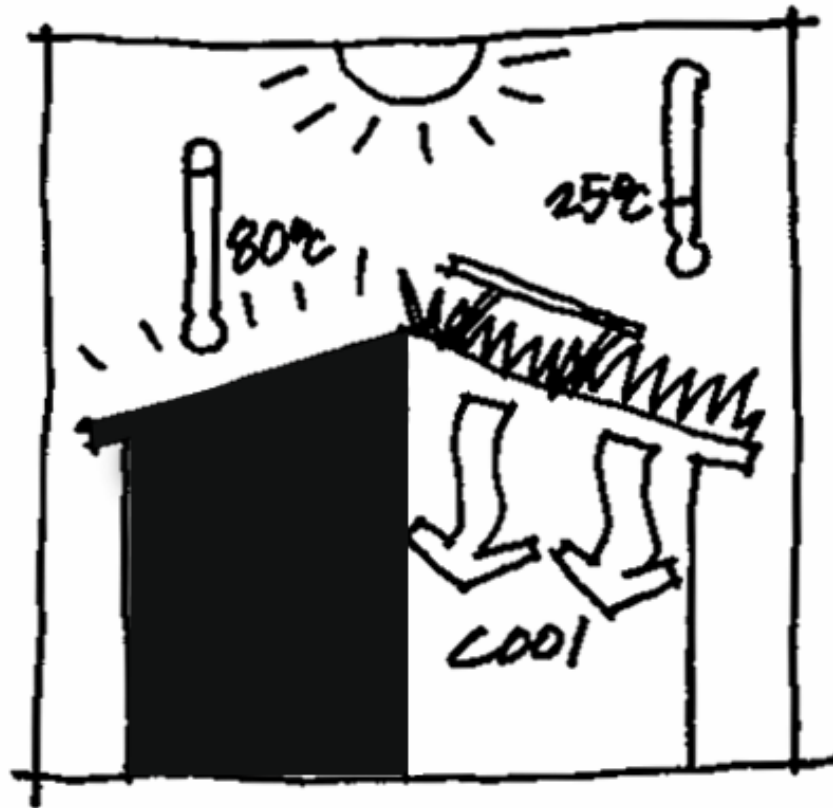
# BENEFITS OF GREEN ROOFS

## CLIMATE CHANGE ADAPTATION

- Rainfall and Water Availability
- Flood Risk
- Temperatures
- The ‘Green Roof Effect’

# BENEFITS OF GREEN ROOFS

## ENERGY BALANCE AND CO<sub>2</sub> REDUCTION

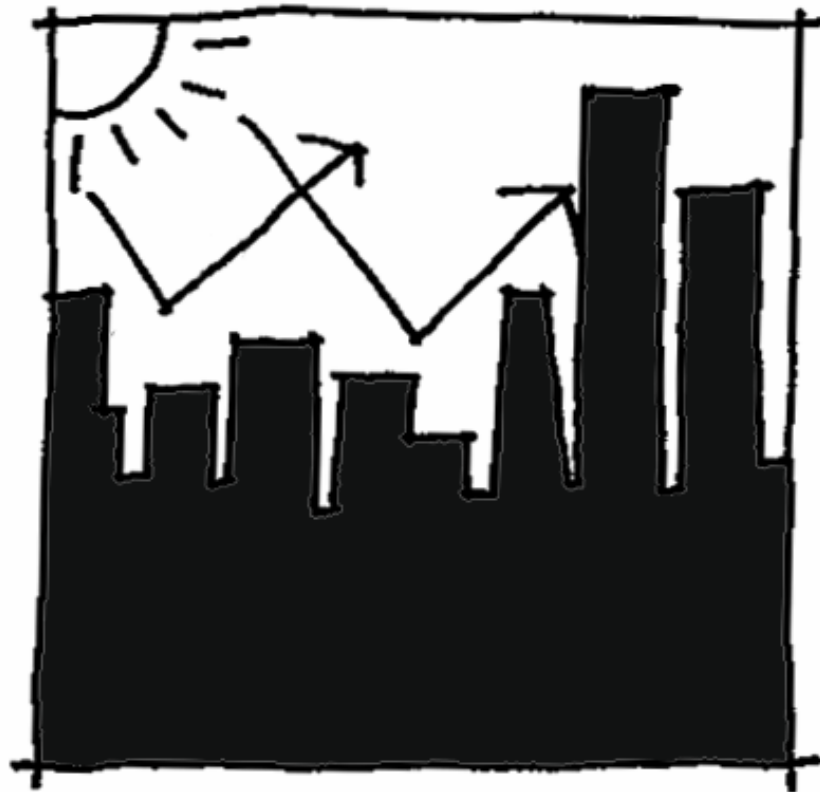


Study of Temperatures Under Membranes of a Conventional and a Green Roof, Nottingham Trent University

	<b>Winter</b>	<b>Summer</b>
Mean Temperature	0 degrees	18.4 degrees
Temp under membrane of Conventional Roof	0.2 degrees	32 degrees
Temp under membrane of Green Roof	4.7 degrees	17.1 degrees

# BENEFITS OF GREEN ROOFS

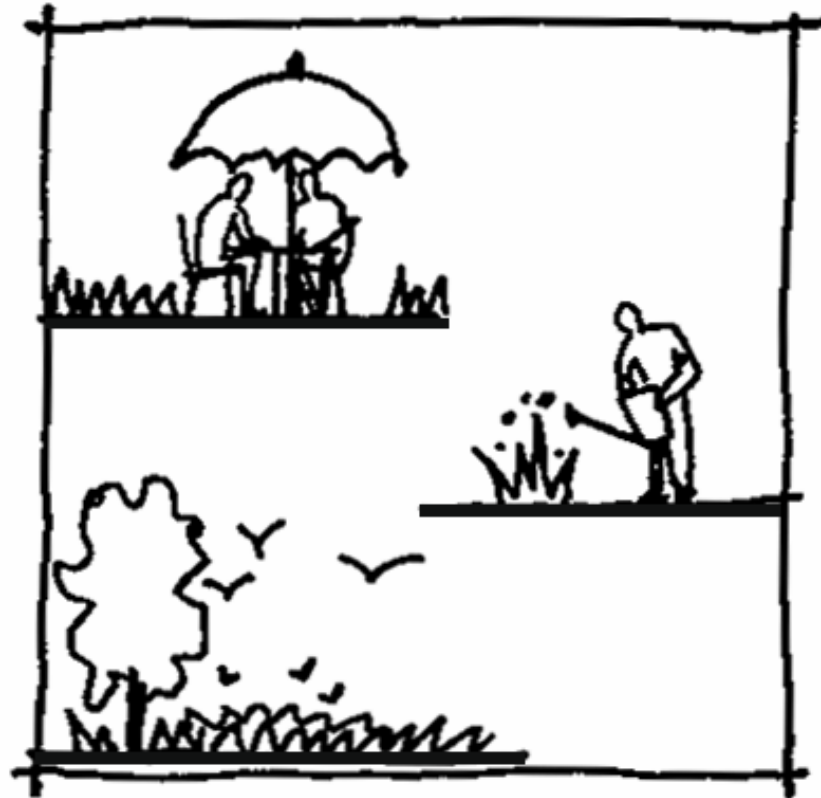
## URBAN HEAT ISLAND EFFECT AND INDIRECT ENERGY SAVINGS





# BENEFITS OF GREEN ROOFS

## AMENITY



# BENEFITS OF GREEN ROOFS

## STORMWATER ATTENUATION



# PERCEIVED BARRIERS TO IMPLEMENTATION

- Cost
- Whole Life Cost
- Structural Issues
- Damage to Waterproofing

# PERCEIVED BARRIERS TO IMPLEMENTATION COST

Green Roofs on new buildings cost approx double conventional roofs.

As an indicative guide:

<i>Depth</i>	<i>Weight</i>	<i>Cost</i>
<b>Extensive Green Roof</b>		
100mm	120 kg/m <sup>2</sup>	\$ 150/m <sup>2</sup>
<b>Semi Intensive Green Roof</b>		
200mm	240kg/m <sup>2</sup>	\$ 180/m <sup>2</sup>
<b>Intensive Green Roof</b>		
500mm	600kg/m <sup>2</sup>	\$ 250/m <sup>2</sup>

Includes water-proofing / geo-fabric / soil / planting / installation. The costs psm are calculated from the sum of cost of product and installation costs.

# PERCEIVED BARRIERS TO IMPLEMENTATION WHOLE LIFE COST

## Service Life of Waterproof Layer

	Single Ply	Bitumastic	Aluminium
Bare Roof	25	30-35	25
With Green Roof	50	60-70	50

# BARRIERS TO IMPLEMENTATION

## STRUCTURAL ISSUES

Indicative Structural Loading for Various Types of Roof

<b>Roof Type</b>	<b>Loading kg/m<sup>2</sup></b>
Gravel Surface	90 - 150
Paving Slabs	160 – 220
Vehicle Surface	from 550
Extensive Green Roof	60 – 150
Intensive Green Roof	200 – 500

Note: Loads are fully saturated

