Ecosystem services:
Connecting nature and people

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THE "SILENT HIGHWAY"-MAN

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The rise of ecosystems thinking

1960s…

1970s…

1980s…

2004/5

- Millennium Ecosystem Assessment

2009-2011

- NEA, NVP, NEF, TEEB, NEWP, WWP
- Defra Action Plans (2007+10), Lawton Review, Nagoya outcomes
- Natural England pilots, National Trust projects, FRM ‘multi-objective’

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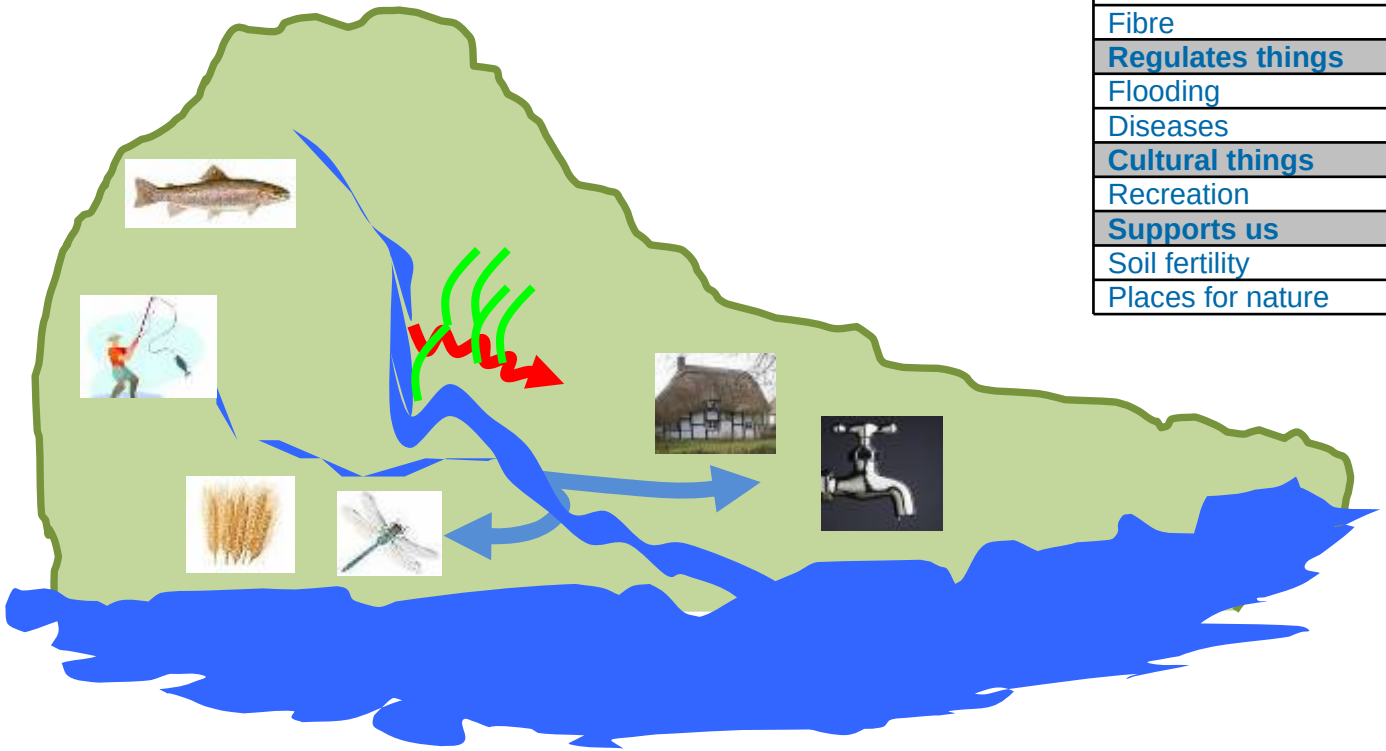
- An overnight success in 25-50 years!

Hurricane Agnes' floodwaters were within inches of overtopping Sunbury's flood wall
(Photo courtesy SRBC archives)

‘What have rivers ever done for us?’

Provide us with things…
Fresh water
Food
Fibre
Regulates things
Flooding
Diseases
Cultural things
Recreation
Supports us
Soil fertility
Places for nature



- Intuitive
- Linking people’s needs/economics benefits with ecosystems
- Making the ‘triple bottom line’ understandable and tractable

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The MA ecosystem services classification…

Provisioning services
Fresh water
Food (eg crops, fruit, fish, etc)
Fibre and fuel (eg timber, wool, etc)
Genetic resources (used for crop/stock breeding and biotechnology)
Biochemicals, natural medicines, pharmaceuticals
Ornamental resources (eg shells, flowers, etc)

Cultural services
Cultural heritage
Recreation and tourism
Aesthetic value
Spiritual and religious value
Inspiration of art, folklore, architecture, etc
Social relations (eg fishing, grazing, cropping communities)

Regulatory services
Air quality regulation
Climate regulation (local temp. /precipitation, GHG sequestration, etc)
Water regulation (timing/scale of run-off, flooding, etc)
Natural hazard regulation (ie storm protection)
Pest regulation
Disease regulation
Erosion regulation
Water purification and waste treatment
Pollination

Supporting services
Soil formation
Primary production
Nutrient cycling (water recirculation in landscape)
Water recycling
Photosynthesis (production of atmospheric oxygen)
Provision of habitat

Addressing ecosystem services in the ‘real world’

- Tight time and resources
  - ❑ Quick decisions
  - ❑ WFD: 8,000+ water bodies
- Understanding interdependencies
- Recognising the value of ecosystems
  - ❑ Practical valuation methods
  - ❑ ‘Real world’ costs and benefits
- Transparency and engagement
- Learning from case studies

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How to do an ecosystem services case study

- **Must** address the whole system
  - Not just one or a few of them!
  - Using the new language is not enough!
    - "The four important services are…"

- Defra '*An introductory guide to valuing ecosystem services*' (2007)

Defra 2007 'likelihood of impact' weighting system

Score	Assessment of effect
++	Potential significant positive effect
+	Potential positive effect
O	Negligible effect
-	Potential negative effect
--	Potential significant negative effect
?	Gaps in evidence / contention

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Pragmatic handling of economic valuation

Risks to avoid:

- ‘Ignoring most of the system’ (exploitation economics)
- Valuing only readily-exploitable services (exploitation economics +++)
- Double counting
- Giving the impression that money values have absolute meaning

- ➢ Case study approach was to seek to value ALL SERVICES…
- ➢ …but being explicit about how double-counting is avoided…
- ➢ …and emphasising that values imply only tendency/magnitude

Other ecosystem services case studies

- TAMAR 2000 (catchment restoration)
  - http://publications.environment-agency.gov.uk/pdf/SCHO0409BPVM-E-E.pdf
- ALKBOROUGH FLATS (managed realignment)
  - http://publications.environment-agency.gov.uk/pdf/SCHO0409BPVM-E-E.pdf
- RIVER GLAVEN Sea Trout Restoration Project
  - http://publications.environment-agency.gov.uk/pdf/SCHO0110BRTZ-e-e.pdf
- Upper BRISTOL AVON Buffer Zone (just 330 metres)
  - http://publications.environment-agency.gov.uk/pdf/SCHO0210BRXW-e-e.pdf
- The MAYES BROOK RESTORATION in Mayesbrook Park, East London
  - http://publications.environment-agency.gov.uk/pdf/SCHO0610BSOW-e-e.pdf
- Options appraisal for WAREHAM HARBOUR coastal defence scheme
  - EFTEC study (see Defra 2007 *An introductory guide to valuing ecosystem services*) http://www.defra.gov.uk/environment/policy/natural-environ/documents/eco-valuing.pdf
- FIVE CASE STUDIES IN EAST OF ENGLAND: Valuing Ecosystem Services in the East of England
  - Glaves, P., Egan, D., Harrison, K. and Robinson, R. (2009). *Valuing Ecosystem Services in the East of England*. East of England Environment Forum, East of England Regional Assembly and Government Office East England. (http://www.gos.gov.uk/goee/docs/193474/193503/vesiee1.pdf.)
- The proposed PANCHESHWAR DAM, India/Nepal
  - http://www.ies-uk.org.uk/resources/papers/pancheshwar_dam_report.pdf

Ecosystem services assessment of Tamar 2000 SUPPORT

MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	**Approx £578,000**	Fresh water accounted for £304,000 with savings of food production contributing £263,319, in addition to £8,269 for fish stock sales and £2,511 for fuel and fibre
Regulatory services	**Approx £2,475,000**	Valued services included £2,455,304 for climate regulation with a further £12,500 for natural hazard regulation and £7,151 for erosion regulation
Cultural services	**Approx £320,000**	Includes £2,511 for cultural heritage and £317,966 for recreation and tourism
Supporting services	**Approx £502,000**	Includes £360,360 for water recycling, £69,114 for provision of habitat, £66,032 for nutrient cycling and £6,269 for soil formation
Gross annual ecosystem services benefits	**Approx £3,875,000**	

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Ecosystem services assessment of Alkborough Flats managed realignment

MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	**Approx £1,700**	Loss of £28,075 from arable conversion, offset by a gain of £26,820 for fibre production (wool production minus loss of straw sales) plus £3,000 sales of rare breeds stock
Regulatory services	**Approx £15,000 (except flood regulation which has a substantial 100-year costed benefit of £12.26 million)**	£14,553 benefit from climate regulation, noting that flood regulation is valued differently in the formal benefit-cost justification for this scheme
Cultural services	**Approx £160,000**	£164,830 for recreation and tourism (ignoring informal recreation), with a net COST of £5,000 for protecting navigation
Supporting services	**Approx £758,000**	£749,438 for provision of habitat plus £8,160 for primary production
Gross annual ecosystem services benefits	**Approx £934,000 excluding contribution to substantial flood regulation value**	

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Ecosystem services assessment of River Glaven sea trout restoration

MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	**Approx £20,000**	Largely related to payments for transition from ELS to HLS agri-environment payments
Regulatory services	**Approx £67,000**	£53,810 in climate regulation, £11,400 in water regulation, and £1,140 in erosion regulation
Cultural services	**Approx £167,000**	£123,459 from recreation and tourism (fishing, shooting and ecotourism), £36,500 as an addendum service of local amenity and informal enjoyment, and £7,200 for social relations (largely volunteer activities)
Supporting services	**Approx £21,000**	Related to provision of habitat
Gross annual ecosystem services benefits	**Approx £275,000**	

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Ecosystem services assessment of upper Bristol Avon buffer zone

MA ecosystem service category	Annual benefit assessed	Notes
Provisioning services	**Approx £500**	£400 for 'fresh water' and £108 for savings on 'food' production
Regulatory services	**Approx £1,800**	£240 in 'climate regulation', with £1,600 on 'erosion regulation' (£1,000 for costs of soil loss from the field and £600 for removal from river)
Cultural services	**Approx £4,600**	£2,975 from 'recreation and tourism' (of which £828 is angling benefit and £2,147 is tourism), £208 as an addendum service of local amenity and informal enjoyment, and £1,450 (32%) for social relations (largely volunteer activities)
Supporting services	**Approx £1,600**	All related to costs averted in 'provision of habitat'
Gross annual ecosystem services benefits	**Approx £8,600**	

Ecosystem services assessment of the Mayes Brook restoration

Ecosystem service	Benefit assessment
Gross annual provisioning service benefits	**There is no uplift to provisioning services** unlike rural studies, but some development options (reuse of trimmings for 'fibre and fuel') could produce provisioning service benefits
Gross annual regulatory service benefits	**Gross annual regulatory service benefits approximately £28,000** (climate regulation + flood risk + erosion) in addition to **'likely significant positive benefits'** for the regulation of both air quality and microclimate
Gross annual cultural service benefits	**Gross annual cultural service benefits approximately £820,000** (recreation and tourism + educational value) in addition to **regional regeneration is assessed with a lifetime (100 year) benefit of £7,822,500** (factored into the final NVP calculation)
Gross annual supporting service benefits	**Gross annual supporting service benefits are approximately £31,000** (nutrient cycling + habitat for wildlife)
Total ecosystem services across the four categories	**Gross annual ecosystem service benefits approximately £880,000** in addition to **'likely significant positive benefits'** for the regulation of both air quality and microclimate as well as a (100-year) contribution to **regional regeneration of £7,822,500**

Benefit-to-cost of 7:1

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Ecosystem service weightings from the Wareham managed realignment case study (after EFTEC, 2007)

Option	Do nothing	Do minimum	Improve defences (rebuild)	**Managed Realignment (vision)**	Managed Realignment (unconstrained)
Supporting services					
Soil formation	+	+	0	**+**	+
Primary production	+	+	-	**+**	+
Nutrient cycling	+	+	-	**++**	++
Provisioning services					
Ecosystem goods	+fish/-agri	+fish/-agri	-fish	**+fish/-agri**	+fish/-agri
Fresh water	0	0	0	**0**	0
Biochemicals/genetics	?	?	?	**?**	?
Regulating services					
Air-quality regulation	0	0	0	**0**	0
Climate regulation	+	+	-	**+**	+
Water regulation	+	+	-	**+**	+
Water purification	+	+	-	**+**	+
Pest regulation	?	?	?	**?**	?
Disease regulation	?	?	?	**?**	?
Pollination	+	+	-	**+**	+
Erosion regulation	+	+	--	**++**	++
Cultural services					
Recreation and tourism	-	-	0	**++/-**	++/-
Aesthetic	+/-	+/-	+	**+**	+
Educational	0	0	0	**+**	+
Cultural heritage	--	--	0	**-**	-

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Five East of England ecosystem services case studies (Glaves *et al*., 2009)

Case study	'Scenarios': marginal impacts of whether or not a planned initiative
Marston Vale	Implementation of the Forest of Marston Vale Plan to 2031
Cambridgeshire Fens	Positive Catchment Scenario Testing (a set of linked positive management initiatives)
Blackwater Estuary	With and without Coastal Realignment in the Blackwater Estuary
Norwich	Conversion of the Deal Ground/Utilities site into open space or development for housing
Great Yarmouth	Impact on health deprivation of increasing and/or improving the Ocean Space provision in Great Yarmouth

Ecosystem services assessment of the proposed Pancheshwar Dam, India/Nepal

MA ecosystem service category	Overall assessment of likely ecosystem service impacts
Provisioning services	The overall balance of benefits of the proposed Pancheshwar Dam scheme are equivocal or negative across the provisioning services, when implications for diverse ecosystems and their dependent stakeholders are assessed in parallel across local and catchment scales. The picture emerging is that some local gains are balanced by other local impacts. However, catchment-scale impacts, which seem not to have framed scheme design, are likely to be overwhelmingly negative. This raises issues of equity in access to the various benefits and costs of the dam scheme, and the extent to which wider ramifications beyond narrowly-defined benefits have been considered along with alternative methods for their achievement
Regulatory services	Assessment of regulatory service impacts, both at the dam site and at catchment scale, reveals substantially negative likely consequences for ecosystems and the interests of the many people dependent upon them, even for the planned benefits for local populations
Cultural services	Assessment of impacts of the dam on cultural services suggests almost unanimous significantly negative outcomes at both dam and catchment scales
Supporting services	Assessment of impacts of the dam on supporting services suggests unanimous significantly negative outcomes at both dam and catchment scales, degrading ecosystem integrity and functioning and the wider resilience and societal benefits that it is able to provide

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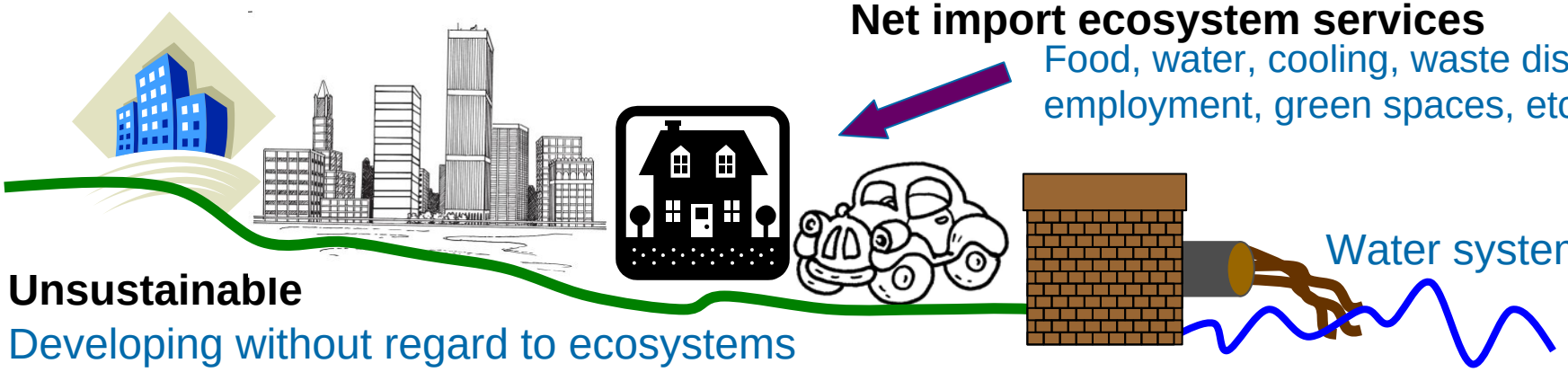
Lessons for applying ecosystem services in practice

1. Thinking at systems level may lead to different observations/decisions
2. Ecosystem restoration maximises value across all ecosystem services
3. Ecosystem services help recognise all stakeholders in decision-making
4. They also help us communicate/engage in socially meaningful terms
5. Local schemes in catchment context can contribute to sustainability
6. Markets have a key role to play
7. We need to ‘mainstream’ systemic perspectives into pragmatic tools

For example, ‘green infrastructure’…



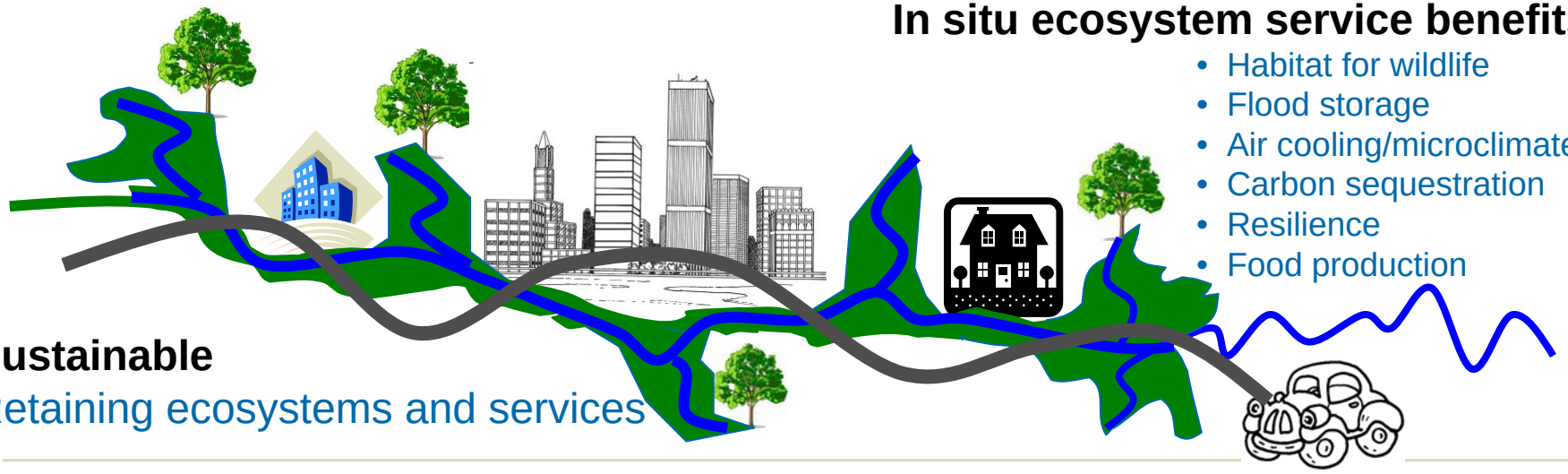
Net import ecosystem services

Food, water, cooling, waste disp, employment, green spaces, etc.

Water system

Unsustainable

Developing without regard to ecosystems



In situ ecosystem service benefits

- Habitat for wildlife
- Flood storage
- Air cooling/microclimate
- Carbon sequestration
- Resilience
- Food production

Sustainable

Retaining ecosystems and services

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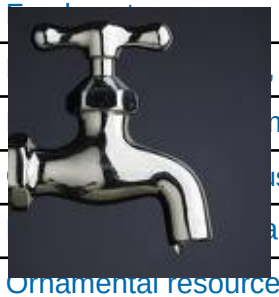
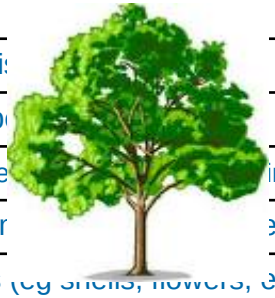
Planning for multiple GI benefits…

Provisioning services


Ornamental resources (eg shells, flowers, etc)

Cultural services



Regulatory services



Disease regulation

Erosion regulation

Water purification and waste treatment

Pollination

Supporting services


- Optimising multiple benefits
- Optimising public value
- Anticipating potential costs
- Adaptive management

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A framework to work together…

- Across disciplines/departments
  - Taking biodiversity out of the ‘conservation ghetto’ and into the mainstream
- Across organisations
  - Outcomes for biodiversity, fish, human health, amenity, flood risk, birds, etc.
- Breaking out of narrow ‘siloed’ remits
- Bigger outcomes for more people
  - Different, interdependent ecosystem service beneficiaries
  - True participation
- Doing it ‘right’ (or at least ‘less bad’ or ‘no regrets’) and doing it once

Aside from equity and sustainability issues…

…why should ecosystem services guide our work?

- **Defra October 2007 Action Plan:**
- **Defra February 2010 Action Plan update:**
- **‘Environmental outcomes’ are not enough:**
  - Value for money arguments
- **Public engagement agenda:**
  - Aarhus Convention, etc.
  - Helping people understand why it matters
  - Providing a framework for interest-based negotiation
- **Partnership working:**
  - Outcomes, synergies, benefits, solutions beyond individual remits
- **Forthcoming requirements and ‘game-changers’:**
  - NEA, NVP, NEF, NEWP, WWP, ‘Big Society’, TEEB, Nagoya, Lawton, etc…

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