





Department of Plant and Environmental Sciences, P.D. Jenssen  
NORWEGIAN UNIVERSITY OF LIFE SCIENCES

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## Grønne tak og vegger



Magasinering og  
fordrøyning av  
regnvann



Operahus Bialystok  
Polen

Kilde: Weber Saint Gobain

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## Fredrikstad - Cicignon Park

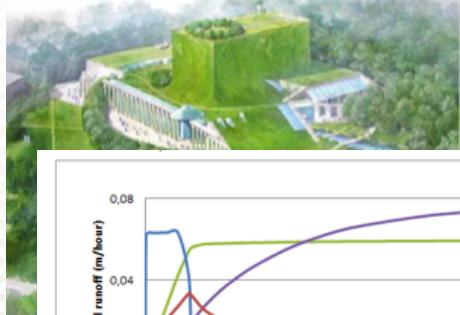


NIELSTORP+ arkitekter minst interiørarkitekter minst  
MODELLBILDE 22.04.15

The Cicignon Park project aims to be BREEAM certified and the buildings should be Zero Emission Buildings (ZEB) and the area a Zero Emission Area (ZEA) (COWI 2016).

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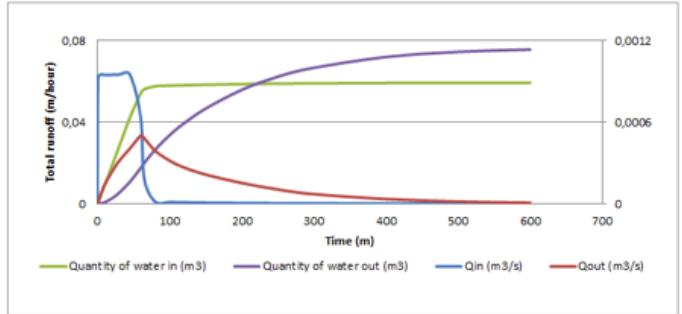


Figure 11 Leca 5m Precipitation 0.001m/s, 60s, model (WC Ks user defined)

Kilde: Weber Saint Gobain

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Vegetated greywater treatment walls - pilot study



(Svete 2012)

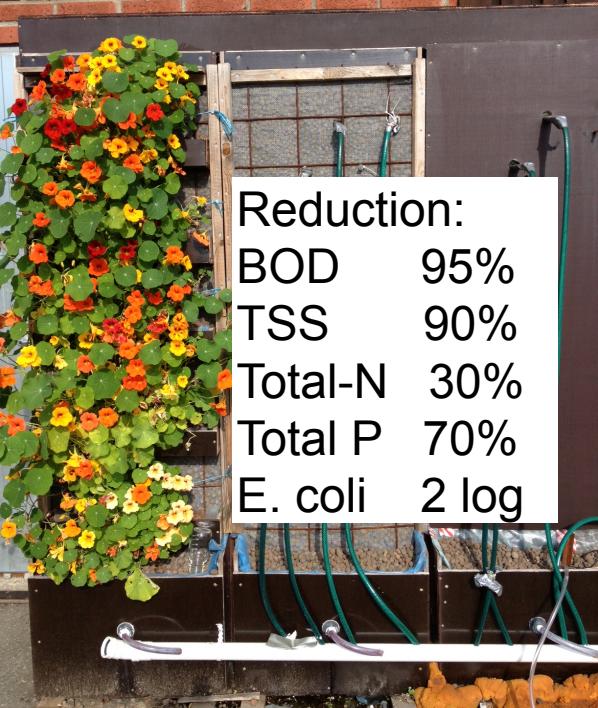
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A photograph showing a vertical garden growing on top of a greywater treatment system. The system consists of several black rectangular components connected by pipes, with a white sign in front displaying reduction percentages. A green logo for the University of Life Sciences is in the bottom left corner.

Reduction:

BOD	95%
TSS	90%
Total-N	30%
Total P	70%
E. coli	2 log

(Svete 2012)



## Food security

Urban horticulture, Havana, Cuba

60 % of the vegetables consumed in Havana are produced within the city limits (Piercy et al., 2010)



Photo: P.D. Jenssen NMBU

## Urban beekeeping - Oslo Norway

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[www.aspelinramm.no/wp-content/uploads/140925ESF573\\_1600x1080](http://www.aspelinramm.no/wp-content/uploads/140925ESF573_1600x1080)

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## Food security/life quality

Tropenhaus; Wolhusen Switzerland



[www.umb.no](http://www.umb.no) [www.tropenhaus.ch](http://www.tropenhaus.ch)

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## Food security/life quality

Tropenhaus; Wolhusen Switzerland



[www.tropenhaus.ch](http://www.tropenhaus.ch) [www.umb.no](http://www.umb.no)



## Moderne byer - matproduksjon i veksthus

**AKTUELLA NYEMISSIONER**  
Information och anannonsbokning Boe Media AB, tel 08-661 00 69

### Peckas Naturodlingar fortsätter resa mot klimatsmart mat i Sverige

Peckas Naturodlingar växlar upp till storskalig produktion av kretsloppsodlade, högkvalitativa matprodukter – utangifter, utsläpp och långa transporter. Bolaget bygger första anläggningen i Härnösand och genomför nu en nyemission inför planerad aktielistning och etablering i landets storstadsregioner.

8 av 10 svenska handlar idag regelbundet ekologiska livsmedel. Med en ny och revolutionerande kretsloppssodling möter Peckas Naturodlingar den starkt växande marknaden för näaproducerade och klimatsmart odlatmatprodukter.

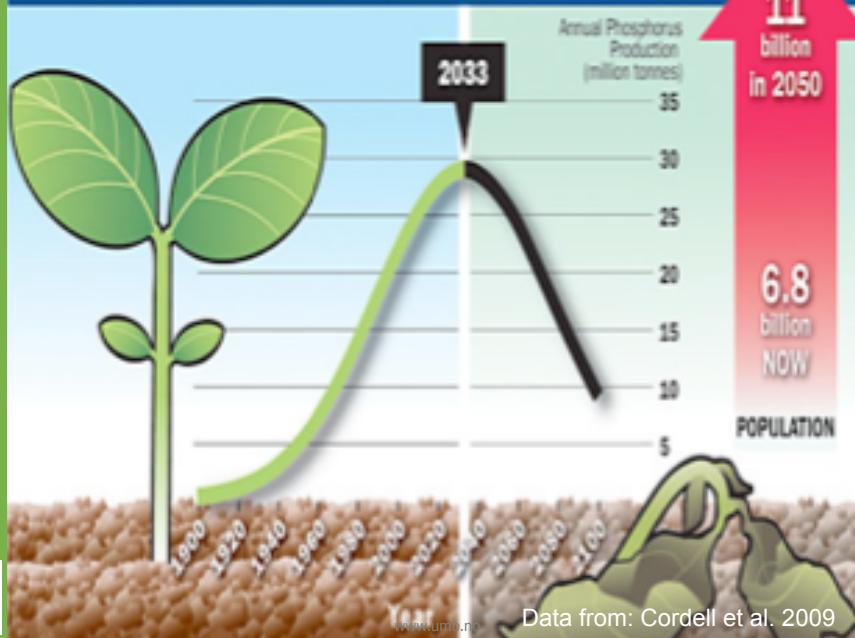
Vi bygger första anläggningen i Härnösand för produktion av rödbeta, sallat och tomater. Samtidigt projekteras en större anläggning i anslutning till något av landets tre storstadsområden. Det finns redan aktörer som visat stort intresse för idén, berättar Hugo Wikström, VD i Härnösandsbaserade Peckas Naturodlingar AB (publ). Hela årsproduktionen från den första

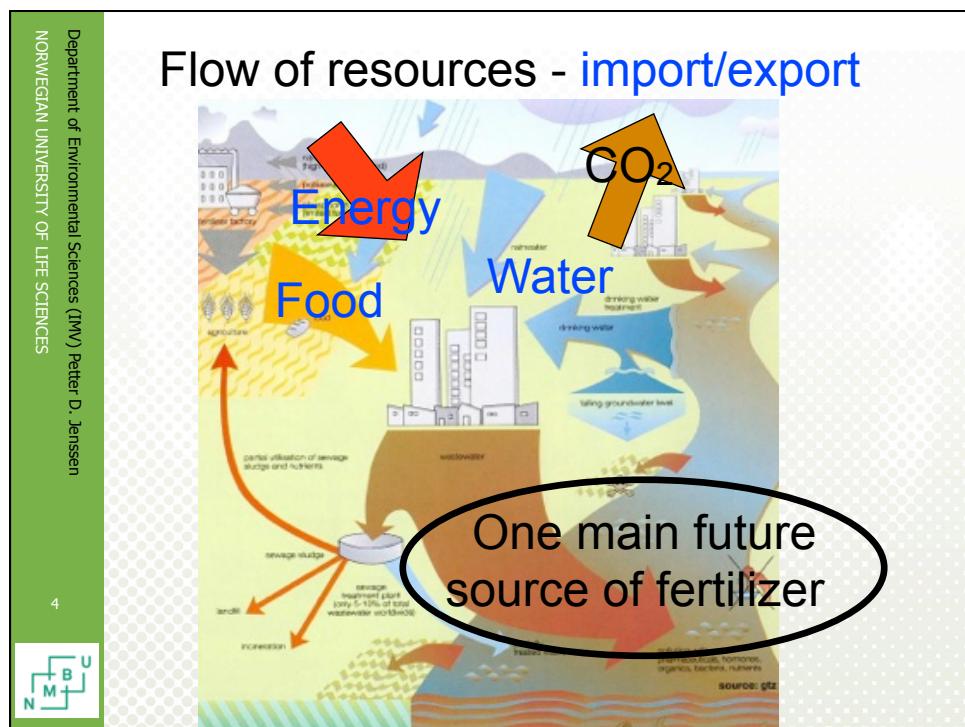
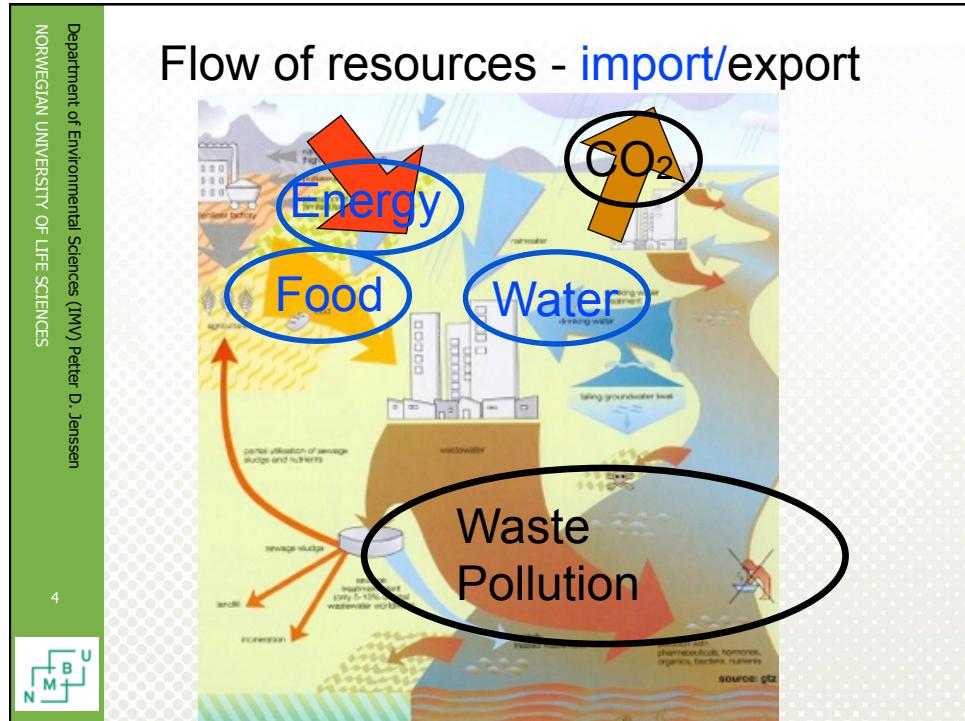
Peckas Naturodlingar odalar fisk och tomater kretslöpssodlat modern akvaponi bestående av en fiskbassäng och ett växthus där fisken ger näring till växterna och växterna renar vattnet

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## NO PHOSPHORUS, NO FOOD





## How can we recycle nutrients from wastewater?

Reuse of sewage sludge from current treatment plants (mainly P recycled)

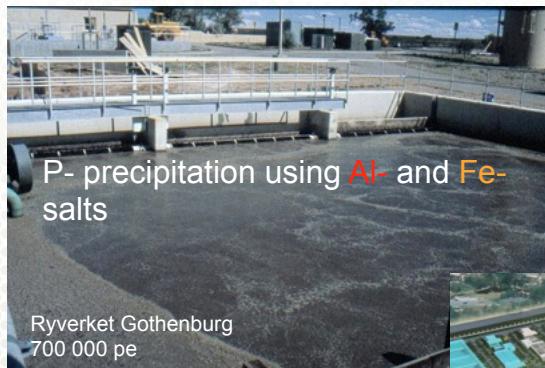
Precipitation of struvite from wastewater (N and P recycled)

Recycle human excreta by the use of source separating systems (N,P and K recycled)



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## Conventional wastewater treatment – technically advanced, energy consuming



Ryverket Gothenburg  
700 000 pe



Tinjan China



Tinjan China

## How can we recycle nutrients from wastewater?

Reuse of sewage sludge from current treatment plants (mainly P recycled)



(Volvo Bokenäs)

Precipitation of struvite from wastewater (N and P recycled)

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## How can we recycle nutrients from wastewater?

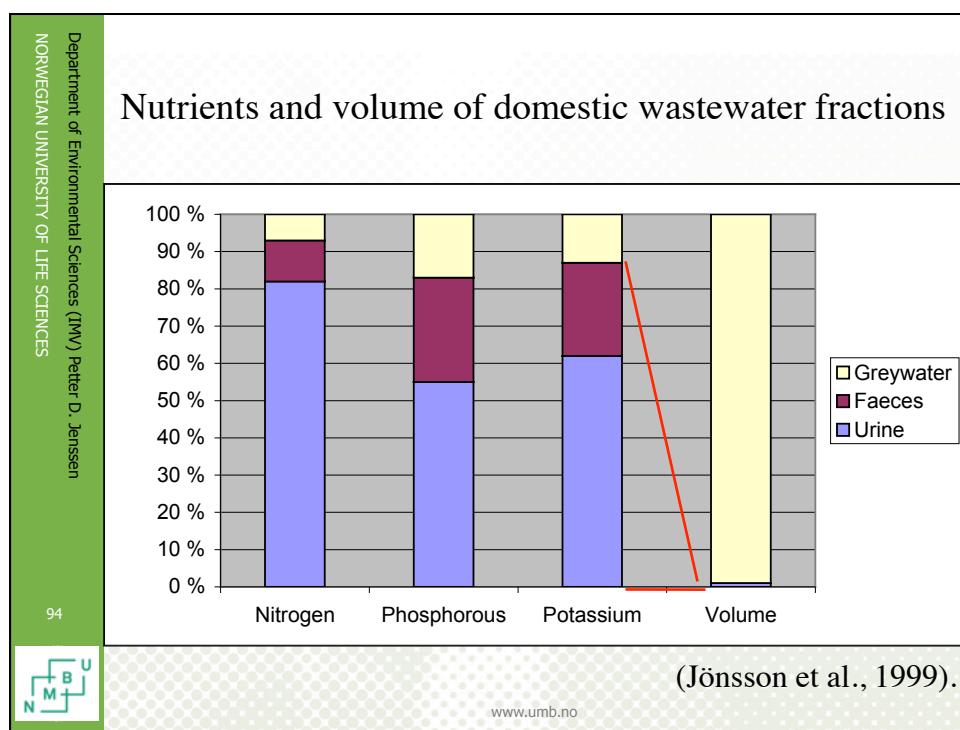
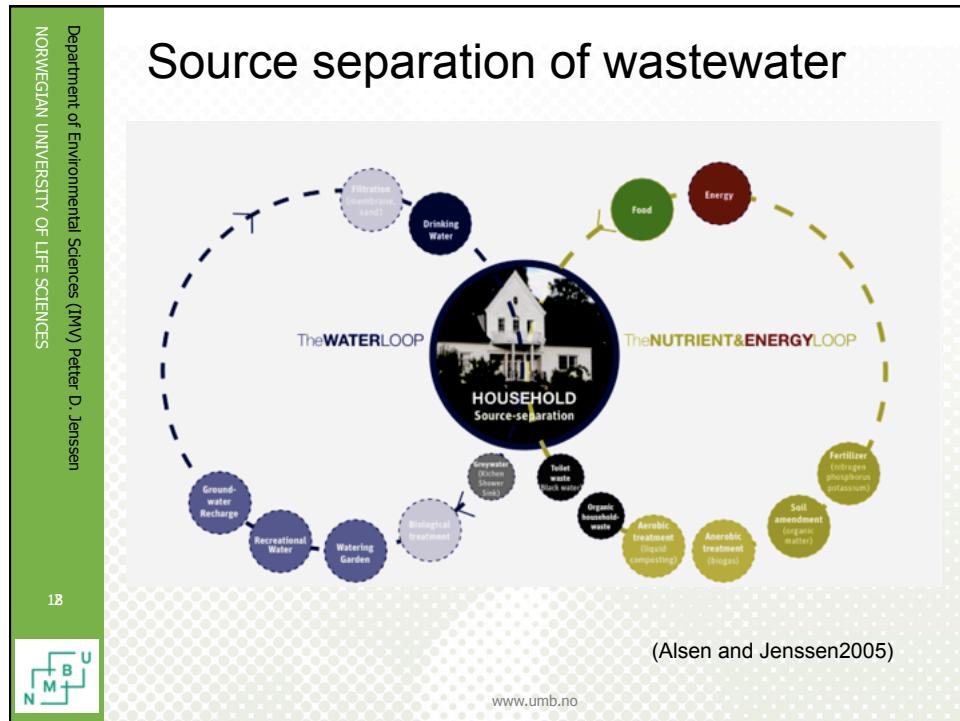
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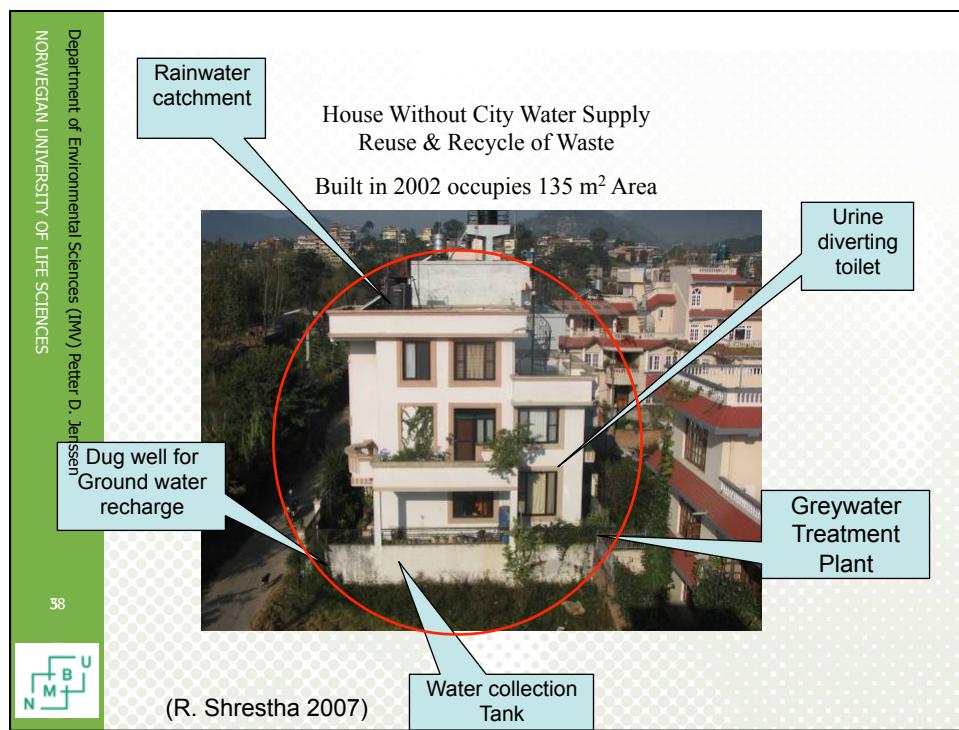
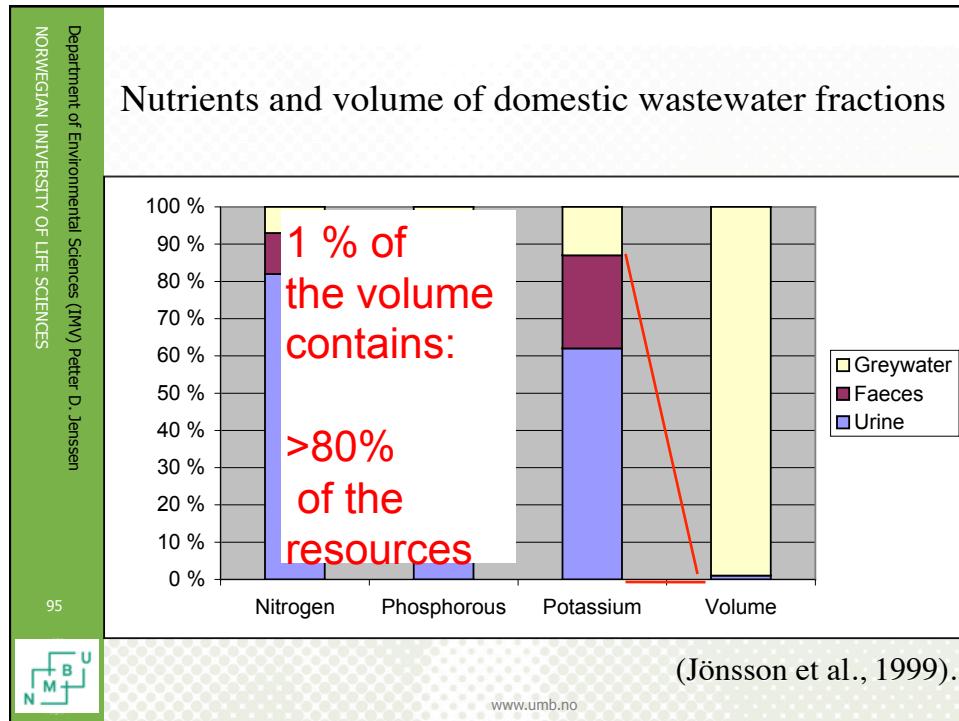


Precipitation of struvite from wastewater (N and P recycled)

Recycle human excreta by the use of source separating systems (N,P and K recycled)

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Vermicomposting of faces



Faeces after 5 to 6 months

www.umb.no

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Composted faeces and urine as fertilizer



www.umb.no

Photos: R. Shrestha

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Treated greywater for irrigation and groundwater recharge

The image contains four photographs illustrating the use of treated greywater for environmental purposes. The top-left photo shows a garden bed with flowers and grass being watered from a hose. The top-right photo shows a similar scene from a higher angle. The bottom-left photo shows a long, narrow garden bed with various plants being watered. The bottom-right photo shows a green, overgrown area with a small stream or pond, likely representing groundwater recharge.

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Photos: R. Shrestha

Watering and car washing even in dry periods

The image contains two photographs. The left photograph shows a person in an orange patterned dress watering potted plants in a garden. The right photograph shows a man washing a silver car with a hose.

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Photos: R. Shrestha

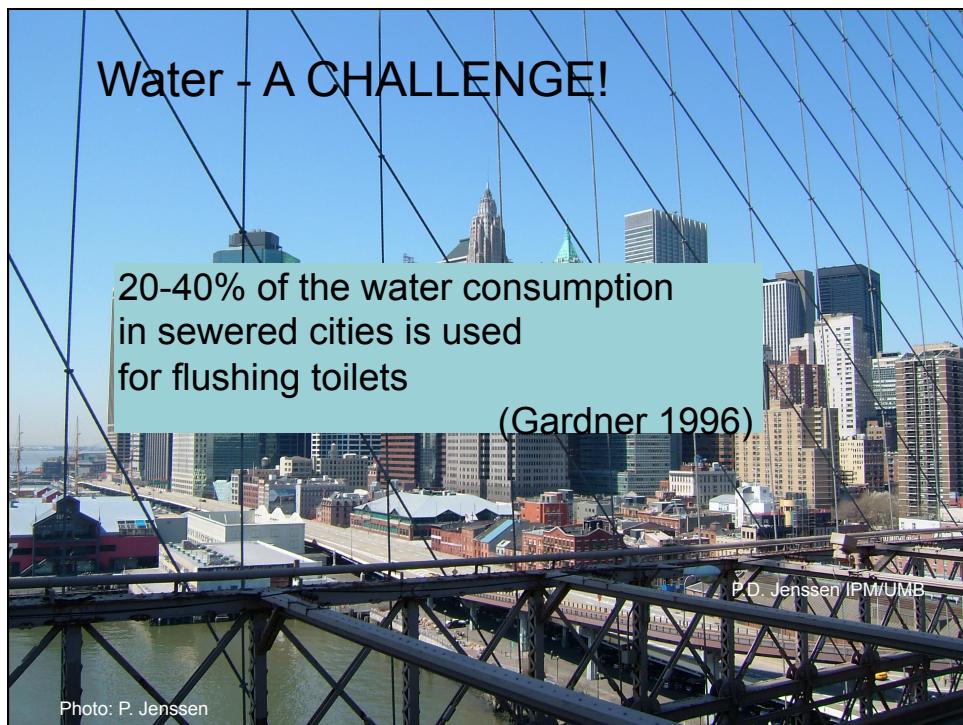
23.03.17

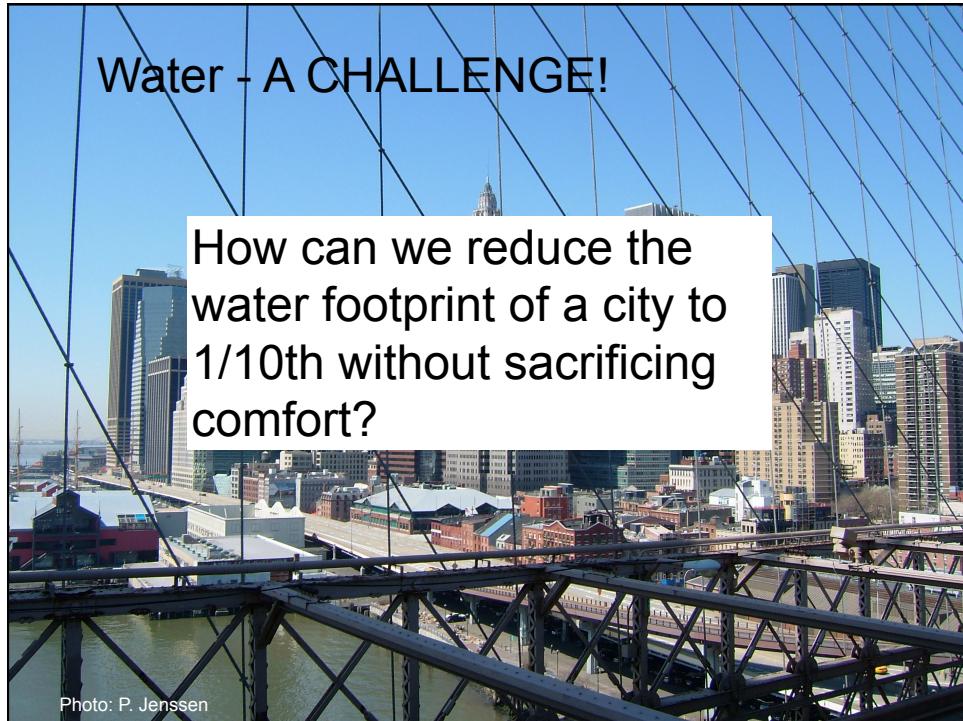
Kathmandu Nepal

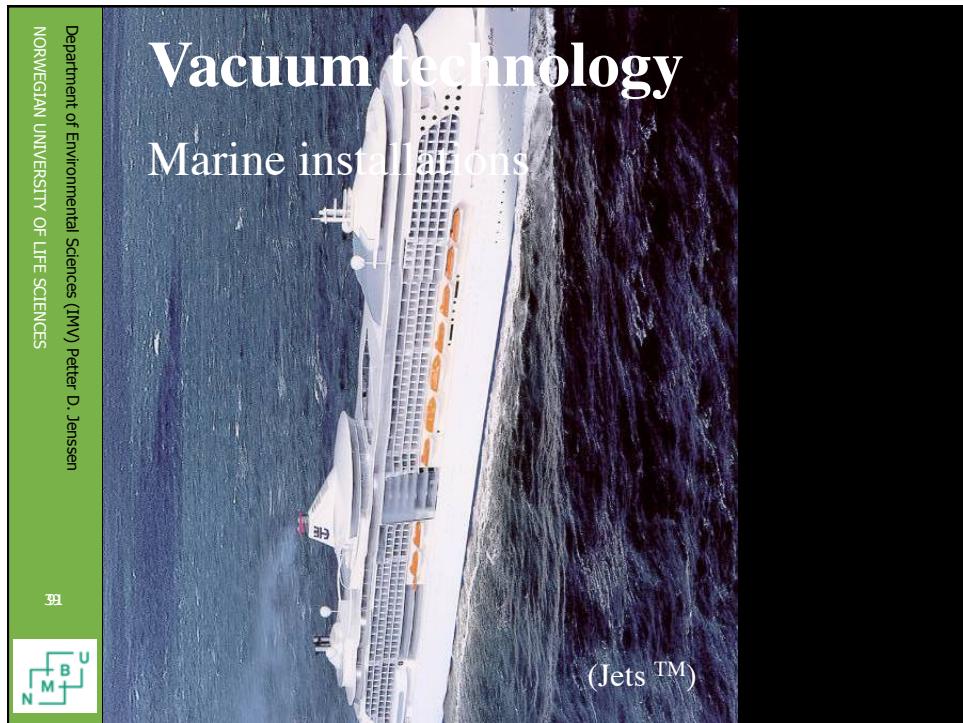


Kathmandu Nepal

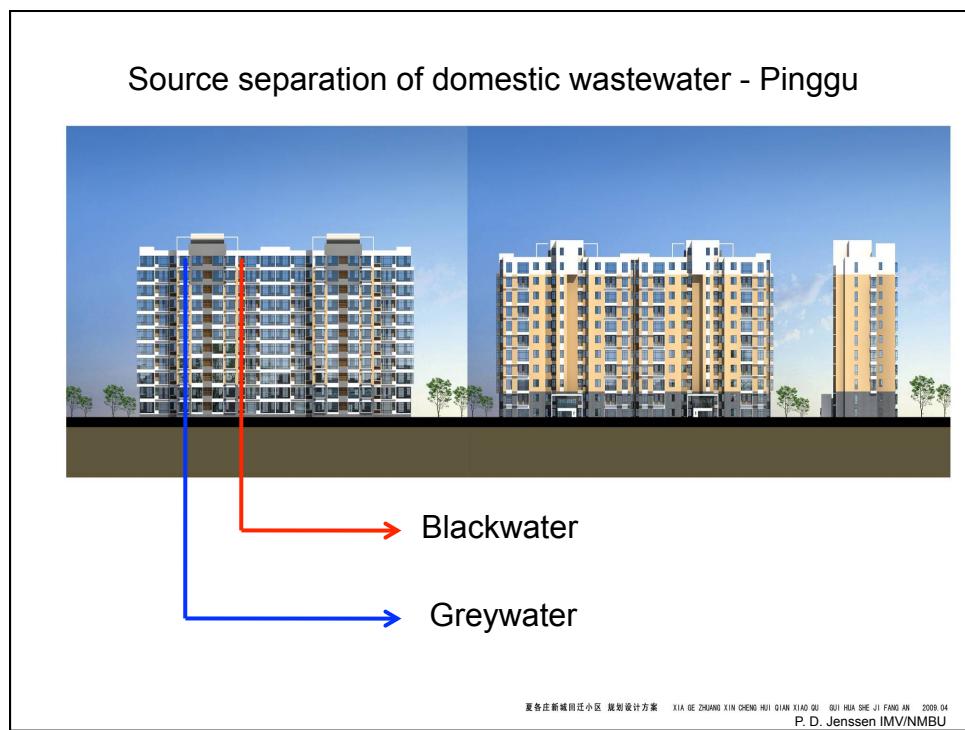








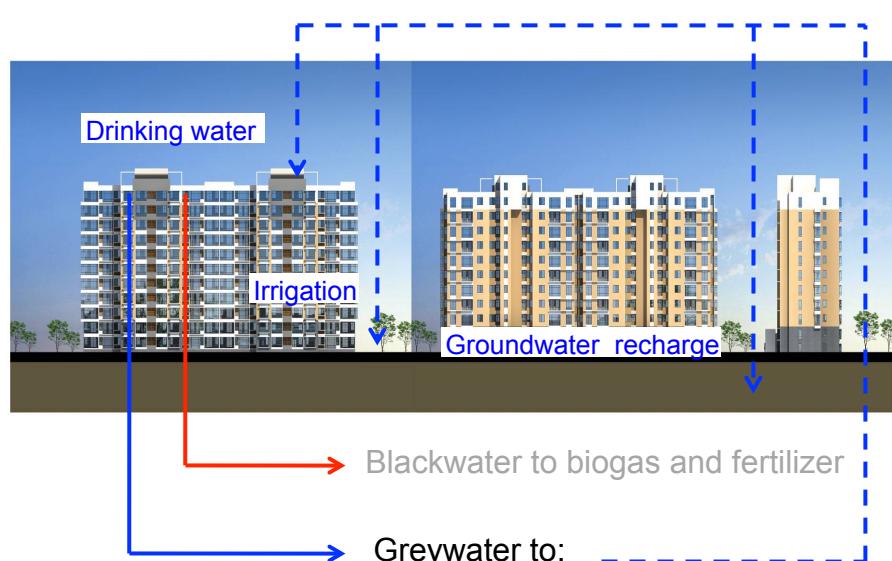
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### Source separation of domestic wastewater - Pinggu



夏各庄新城回迁小区 规划设计方案 XIA GE ZHANG XIN CHENG HUI QIAN XIAO QU GUI HUA SHE JI FANG AN 2009.04  
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