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Succesfactoren voor klimaatadaptatie

Effectief beleid voor open bodem en groen in Europese voorlopersteden

RIVM briefrapport 270001003/2013
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Rapport in het kort

De klimaatverandering zal naar verwachting de komende decennia in Nederlandse steden meer perioden van hitte en droogte veroorzaken. Ook zullen intensievere regenbuien optreden die wateroverlast met zich meebrengen. Uit onderzoek van het RIVM blijkt dat sommige Europese steden effectief beleid hebben ontwikkeld voor de aanleg van parken, groenstroken en stadslandbouw in de stad om deze effecten te verminderen. Dit beleid wordt echter vaak ‘ad-hoc’ en geïsoleerd geïmplementeerd. Landen en steden zouden meer van elkaars ervaringen kunnen leren. Het onderzoek geeft een overzicht van wat steden zelf rapporteren als lokale en gemeenschappelijke succesfactoren voor groene ruimte en stadslandbouw. Op basis daarvan schetst het RIVM hoe de Nederlandse overheid, lokale overheden, burgers en marktpartijen effectief kunnen werken aan (meer) groen in de stad.

In Duitsland bijvoorbeeld heeft nationale regelgeving voor het behoud van natuur het voor lokale overheden gemakkelijker gemaakt om groenmaatregelen te implementeren. Een goede samenwerking tussen lokale overheid, burgers, en soms ook private partijen, die wordt bekrachtigd door bindende afspraken, blijkt een andere succesfactor bij de aanleg van groen in steden. De aanleg van groen is in Freiburg, Berlijn, Faenz, Malmö, Linz en London gestimuleerd door groenaanleg op te nemen in bestemmingsplannen, de bouw van duurzame wijken of contracten tussen de gemeente en woningbouwcorporaties. In Manchester, Lyon en Parijs is actief ingezet op stadslandbouw, als onderdeel van groenbeleid of om gezond, duurzaam geproduceerd voedsel voor iedereen beschikbaar te stellen. Vaak waren er triggers om deze veranderingen door te voeren, zoals de hereniging in Berlijn, de Olympische Spelen in Londen en de voorspelde toekomstige wateroverlast in Malmö. Overheden kunnen groenbeleid stimuleren door te faciliteren dat partijen die betrokken (kunnen) zijn bij de implementatie ervan kennis, informatie en ervaringen uitwisselen.

Trefwoorden:
klimaatadaptatie, groen, bodem, waterberging, stad, beleid

Abstract

Key factors for climate change adaptation: successful green infrastructure policies in European Cities

In the decades to come, Dutch cities are expected to experience more periods of prolonged heat and drought as a result of climate change. Similarly, rainfall is likely to be more intense, giving rise to localised flooding. Some cities have already developed an effective strategy which provides for the introduction of parks, open areas and urban agriculture to mitigate these effects. However, such policy is often implemented in isolation and on an ad hoc basis. Countries and cities can learn much from each other's experiences. This report sets out the self-reported local and shared success factors in the introduction of green space and urban agriculture from a number of European cities. RIVM describes opportunities for the Dutch government, local authorities, market parties and individuals which emulation of the successful approaches may represent.

In Germany, for example, we see that national legislation intended to promote nature conservation has made it easier for local authorities to implement 'greening' measures. Good cooperation between local authorities and the general public (and in some instances private sector organizations) is a further success factor, particularly when backed by binding agreements. In Freiburg, Berlin, Faenza, Malmö, Linz and London, the introduction of (more) greenery has been promoted by including minimum requirements for green space in zoning plans, through housing development projects which devote considerable attention to sustainability, and by means of formal contracts between local authorities and housing corporations. In Manchester, Lyon and Paris, urban agriculture has been adopted as a component of green policy and as a means of ensuring a constant supply of healthy and sustainably produced food for everyone. In many cases, such changes were prompted by specific 'triggers': reunification in Berlin, the Olympic Games in London, and the on-going risk of flooding in Malmö. One opportunity for the government is to stimulate the implementation of green space policies by facilitating exchange of knowledge and experiences between different stakeholders.

Keywords:
climate adaptation, water management, policy, green, greenery, city, urban planning

Inhoudsopgave

1 Inleiding

Eerdere rapporten van het RIVM beschreven hoe het bodemwatersysteem ingezet kan worden voor een klimaatbestendige en gezonde stad (Claessens & Dirven-van Breemen, 2010; Claessens, Schram-Bijkerk et al., 2012). De focus in deze rapporten lag op het klimaatadaptatiebeleid in Nederland. Nederlandse voorbeelden zijn ook beschreven in het boek 'Ruimte voor klimaat' (Pater, 2011). Hoewel enkele Nederlandse gemeenten klimaatadaptatie voortvarend hebben opgepakt, zijn veel gemeenten nog afwachtend, bijvoorbeeld vanwege de bezuinigingen of bestuurlijke belemmeringen. Dit geldt ook voor andere Europese steden (European Environment Agency, 2012). In dit rapport beschrijven we hoe Europese voorlopersteden de aanleg van groen in het kader van klimaatadaptatie hebben gerealiseerd; welke beleidsinstrumenten hebben zij ingezet?
Het doel van dit onderzoek is om succesfactoren voor effectief beleid voor open bodem en groen te identificeren. We richten ons op groene ruimte (parken, groenstroken) en stadslandbouw. Met dit rapport beogen we kansen te schetsen voor het klimaatadaptatiebeleid in Nederland. De onderzoeksvragen zijn:

1. Wat is de rol van Europees, nationaal en lokaal beleid bij de aanleg van groen in Europese voorlopersteden?
2. Welke beleidsinstrumenten worden ingezet (regelgeving, financiële prikkels en/of communicatie)?
3. Welke actoren (vanuit overheid, markt en/of combinatie) zijn bepalend voor het beleid in de afzonderlijke fasen van de beleidscyclus?
4. Wordt synergie gezocht met beleidsdoelen rond bodem, waterberging, biodiversiteit en/of gezondheid?

Een soortgelijke analyse is recent uitgevoerd voor groene daken in Bazel, Chicago, London, Stuttgart en Rotterdam (Mees, Driessen et al. 2013). Zij concludeerden op basis van beleidsdocumenten en interviews met stakeholders het volgende:

- De beginfase van het beleidsproces werd bij groene daken gedomineerd door publieke verantwoordelijkheid, bijvoorbeeld om wateroverlast tegen te gaan. Lokale overheden bepaalden het beleid en de strategie (deels na consultatie van private actoren), om daarmee private actie te stimuleren. Private verantwoordelijkheid uitte zich vooral in de implementatie- en onderhoudsfase van het beleidsproces.
- Het belangrijkste verschil tussen de steden: hoewel alle lokale autoriteiten een belangrijke verantwoordelijkheid hadden in de planfase, was de publieke verantwoordelijkheid veel groter in Bazel en Stuttgart. Beide steden hebben een verplichting voor groene daken bij nieuw/herbouw opgenomen in het lokale bouwbesluit en voeren een actief monitoring- en controle beleid. Deze steden hadden de hoogste implementatieniveaus van groene daken en een goed ontwikkelde markt voor groene daken, gemeten naar het prijsniveau.
- Succesfactoren in Bazel en Stuttgart: de verplichting vooraf laten gaan door een langdurig subsidie- en communicatietraject, de invoer van een rioolheffingskorting als compensatie van de aanlegverplichting en het betrekken van private partijen in het beleidsontwerp.

Op basis daarvan gaven zij de aanbeveling om groene daken mee te laten wegen in duurzaamheidsnormen voor gebouwen en convenanten af te sluiten tussen woningcorporaties en de gemeente. De auteurs stelden dat er nog veel meer potentie uit groene daken te halen valt en dat publieke verantwoordelijkheid noodzakelijk is om dit potentieel te benutten, zeker in de beginfase van het beleidsproces. In dit onderzoek beschrijven we of deze en andere succesfactoren ook gelden als het gaat om groene ruimte of stadslandbouw. In tegenstelling tot het onderzoek van Mees et al., waarin interviews met stakeholders gehouden zijn, beperken we ons hier tot een overzicht van wat over de steden in de bestaande (grijze) literatuur te vinden is.

2 Methoden

Veel Europese voorbeelden van klimaatadaptatie zijn beschreven in de grijze literatuur. Zo staan er voorbeelden in het boek over groenblauwe netwerken (Pötz and Bleuzé, 2012), het rapport van het Europese GRaBS (Green and Blue Space Adaptation for Urban Areas)-project en het rapport van de European Environmental Agency (European Environment Agency, 2012). Uit deze en andere bronnen zijn steden geselecteerd die voldeden aan de volgende criteria:

1. aanleg van groene ruimte of stadslandbouw
2. zoveel mogelijk verspreid over Europa
3. voldoende informatie beschikbaar om onderzoeksvragen te kunnen beantwoorden
4. niet opgenomen in het overzicht m.b.t. groene daken (Mees, Driessen et al. 2013).

De informatie uit verschillende boeken, rapporten en van internet is in tabellen samengevat, zie bijlage 1. De door de steden zelf beschreven succesfactoren zijn vergeleken met succesfactoren die de European Environmental Agency noemde in het rapport ‘Urban adaptation to climate change in Europe’ (European Environment Agency, 2012), zie bijlage 2.

3 Resultaten

Onderstaande tabel beschrijft welke beleidsmaatregelen zijn getroffen in Freiburg, Berlijn, Faenza, Malmö, Linz, London en Kalamaria om groen in de stad te realiseren. Daarnaast wordt voor Manchester, Lyon en Parijs beschreven hoe stadslandbouw is gerealiseerd. De tabel geeft ook de factoren weer die, volgens de bestaande literatuur, bij hebben gedragen aan het succes van het beleid. Een uitgebreidere beschrijving van het beleid in deze steden en de bijbehorende informatiebronnen zijn opgenomen in bijlage 1. In onderstaande tekst beschrijven we puntsgewijs de resultaten per fase in de beleidscyclus.

Agendering

- Er waren vaak 'triggers' om veranderingen door te voeren (Berlijn: de hereniging, Augustenborg en Manchester: management van achterstandswijken, Olympische Spelen, Linz: woningnood). 'Local vulnerability assessments' kunnen ook een trigger zijn om veranderingen door te voeren (bv. dreiging nog meer overstromingen in Malmö, hitte en infectieziekten in Londen).
- Het initiatief komt meestal vanuit de lokale overheid; deze heeft een grote rol in het hele proces (zie ook conclusies Mees et al. 2013).

Tabel 3.1: Zelf-gerapporteerde succesfactoren per voorbeeldstad.

Stad (land)	*Maatregel*	*Zelf-gerapporteerde succesfactor(en)*
Aanleg van groen		
Freiburg (Duitsland)	City Land Use Plan 2020; minder ruimte voor bebouwing en aanleg van 'cool air corridors'	- Prioritering van landschapsbehoud - Burgerparticipatie in verschillende fasen van gemeentelijk beleidsproces
Berlijn (Duitsland)	Landspace plans incl. Biotope Area Factor; Een gedeelte van elke bouwkavel wordt als groene ruimte bestemd	- Wettelijke verplichting; uitwerking van nationale regelgeving - Interdepartementale samenwerking - Flexibiliteit bij uitvoering - Beschikbaarheid landgebruik- en klimaatkaarten
Faenza (Italië)	Bio-neighbourhood incentive programme; projectontwikkelaars ontwerpen duurzame wijken met veel open ruimte	- Aansluiting bij Agenda 21[1] - Innovatie door ontwikkelaars - Betrokkenheid burgers en ontwikkelaars bij stadsinrichting - Versnelde procedure vergunningverlening - Koppeling met mitigatie, geluidsreductie en monumentenzorg
Malmö (Zweden)	Managementcontract tussen woningbouwcorporatie en gemeente m.b.t. water, groen en afval	- Samenwerking en goede communicatie tussen gemeente, woningbouwcorporatie en burgers - Financiering uit lokale en (inter)nationale budgeten - Private partijen zijn aangesloten - Koppeling met mitigatie en educatie

[1] A non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development.

Stad (land)	*Maatregel*	*Zelf-gerapporteerde succesfactor(en)*
Linz (Oostenrijk)	Solar City Project; een modelwijk met laag energiegebruik en veel groen	- Samenwerking gemeente met stadsarchitect en beroemde ontwerpers - Financiering uit lokale en (inter)nationale bronnen - Koppeling met mitigatie, recreatie en transport - Inspelen op woningbehoefte
London (Engeland)	Green Grid Project incl. Olympic park	- Inspelen op actualiteit en populariteit Olympische Spelen - Koppeling met veel andere beleidsterreinen, o.a. transport, gezondheid, biodiversiteit
Kalamaria (Griekenland)	Lokaal klimaatadaptatie plan met focus op groene ruimte en water	- Interdepartementale samenwerking - Participatie belanghebbenden - Uitwisseling met andere Europese steden via EU-GRaBS project
Stadslandbouw		
Manchester (Engeland)	Manchester Community Strategy incl. gezond, duurzaam geproduceerd voedsel voor iedereen	- Samenwerking stadsbestuur met 'National Health Service', vrijwilligers en private partijen - Koppeling met gezondheidsbeleid (overgewicht en gezondheidsverschillen), sociaaleconomische situatie, duurzame voedselproductie
Lyon (Frankrijk)	Jardin Citoyen; een tuinenprogramma	- Samenwerking en heldere taakverdeling gemeente en burgers - Vastgelegd als bestemming in groen planning van de stadsregio - Benoeming van 'tussenpersoon'/ gangmaker - Koppeling met educatie, sociaaleconomische doelen, leefomgeving, voedselproductie
Parijs (Frankrijk)	Jardins Partagés, opgenomen in 'Green Hand Pact'	- Koppeling met veel andere beleidsterreinen, o.a. sociale cohesie, cultuur, educatie - Flexibiliteit; inspelen op stadsdynamiek (braakliggende terreinen)

Beleidsontwerp

- Een belangrijke succesfactor in veel voorbeelden is een goede samenwerking tussen lokale overheid, burgers, en soms ook private partijen. Vaak worden de verantwoordelijkheden vastgelegd in een contract. Een gangmaker of projectleider kan als schakel tussen burger en overheid worden ingezet (bv. Lyon, Malmö).
- Vaak wordt een verbinding gelegd tussen verschillende beleidsvelden. Motivatie voor stadslandbouw is heel divers, maar klimaatadaptatie wordt niet genoemd. Gezondheid wordt een paar keer genoemd als motivatie voor de aanleg van groen. Het belang van open bodem wordt vaak herkend met het oog op waterberging en soms wordt het belang van de bodem gekoppeld aan biodiversiteit.

Implementatie

- Inzet instrumenten; communicatie wordt bijna altijd ingezet ivm publieke participatie (vaak goede communicatieplatforms), soms regelgeving (=succesfactor!). Financiële prikkels worden niet vaak ingezet in deze voorbeelden (behalve subsidies voor plan als geheel, niet voor individuen). Subsidies voor groene daken zijn effectief (Mees et al, 2013).
- Vaak wordt gebruik gemaakt van nationale / Europese budgetten (bv Berlijn, voor wederopbouw).
- Nationaal beleid/wetgeving kan ondersteunend werken, bv in Duitsland, dat grondeigenaren verantwoordelijkheid hebben voor 'social goods'.
- Het kan helpen om informatie beschikbaar te stellen op lokaal niveau (bv Berlijn; kaarten van de stad mbt landgebruik en milieufactoren) en op nationaal niveau (bv stadtklimatlose, UCKIP, zie bijlage 2).
- Klimaatadaptatie wordt vaak ‘ad-hoc’ en geïsoleerd geïmplementeerd, zie ook het EEA rapport. Kalamaria is hierop een uitzondering; dit initiatief vond plaats binnen het EU-GRABS project waarin steden ervaringen en instrumenten uitwisselden.

Uitvoering, handhaving en evaluatie

- In Faenza is sprake van controle op naleving van de voorschriften.
- Resultaten worden vaak niet geëvalueerd en de voortgang niet gemonitord. Uitzonderingen zijn Berlijn, Augustenborg (Malmö) en Linz, waar resultaten worden geëvalueerd aan de hand van een set van indicatoren voor bijvoorbeeld waterberging en de sociaaleconomische status van de wijk.

4 Conclusie en aanbevelingen

Op basis van de resultaten concluderen we dat er veel kansen liggen voor Nederland om effectief beleid voor open bodem en groen te implementeren. In onderstaande tekst schetsen we de kansen voor de verschillende partijen die betrokken (kunnen) zijn bij de implementatie. Daarnaast doen we aanbevelingen voor nader onderzoek.

Kansen nationale overheid

- Klimaatadaptatie op de agenda zetten door het uitwerken en implementeren van een Nationale Adaptatie Strategie (NAS). Daarbij kan ingespeeld worden op de nieuwe EU adaptation strategy, april 2013. Alle bovengenoemde landen hebben een NAS, behalve Griekenland en Italië (in beide landen in ontwikkeling). Engeland heeft een tijd een nationale indicator gehad, wat steden stimuleerde het onderwerp te agenderen.
- Zorg voor een beleidskader waarin steden groene daken of ruimten kunnen stimuleren.
- Klimaatadaptatie opnemen in de Omgevingswet, bv. door voor water- en bodembeleid een lange tijdshorizon verplicht te stellen.
- Informatievoorziening, bijvoorbeeld door communicatie- en informatieplatforms.

Kansen lokale overheden

- Wissel ervaringen uit met andere steden, bijvoorbeeld via het platform EU CLIMATE-ADAPT.
- Zorg voor goede samenwerking tussen burgers, overheden en private partijen en verschillende beleidssectoren en leg verantwoordelijkheden vast in een contract.
- Maak gebruik van financieringsmogelijkheden vanuit de EU; MFF, EU green infrastructure, EU cohesion policy, LIFE, horizon2020, INTERREG, URBACT.
- Stimuleer de aanleg van groen via financiële prikkels, zoals subsidies voor groene daken en rioolheffingskorting (zie voorbeelden Mees et al., 2013).
- Vorm nieuwe netwerken, inclusief private partijen die kunnen bijdragen aan lange termijn financiering (voorbeelden Mees 2013, Malmö Green Roof Institute & Car Pool).
- Zet stadslandbouw, waar veel burgers belangstelling voor hebben, in als klimaatadaptatie. Beschouw bodem daarbij niet alleen als ‘risico’ maar ook als kans.
- Formuleer meetbare doelen aan de hand van indicatoren en evalueer de korte- en lange termijn effecten van maatregelen.

Kansen voor burgers

- Energiebesparing, bijvoorbeeld door isolatie door groene daken.
- Een prettige, groene leefomgeving.
- Gunstige invloed van groen op huizenprijzen.
- Contacten met buurtbewoners, bijvoorbeeld door gezamenlijk moestuinbeheer.
- Kostenbesparing op boodschappen door consumptie moestuingewassen
- Speelruimte voor kinderen.
- Natuur- en milieueducatie aan kinderen.

Kansen voor marktpartijen

- Nieuwe markten, bijvoorbeeld voor groene daken.
- Makkelijker vergunningstraject voor nieuwbouw (zoals in Faenza).
- Innovatie bij de bouw van woningen.
- Profileren op duurzaamheid.

Aanbevelingen voor nader onderzoek

- Evaluatie van communicatie- en informatieplatforms voor klimaatadaptatie. Interviews met stakeholders om te kijken hoe bestaande klimaatadaptatie-platforms gebruikt en gewaardeerd worden.
- Evaluatie van resultaten van klimaatadaptatie: welke indicatoren zijn bruikbaar om de resultaten te 'meten'?
- De informatie over klimaatadaptatie die uit vele, lopende onderzoeken in Europa komt samenbrengen en beschikbaar maken voor Nederlandse beleidsmakers en belanghebbenden.
- Nader onderzoek naar de mogelijke rol van stadslandbouw als onderdeel van klimaatadaptatie. Welke gezondheidswinst kan stadslandbouw opleveren? Hoe om te gaan met mogelijke bodemverontreiniging? Deze vragen worden deels opgepakt in het kader van het Europese SNOWMAN-project.

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Bijlage 1: Tabellen voorbeeldsteden

	Green space			
City of Freiburg	Legal instruments	Economic instruments	Communication instruments	Results
(Vaessen 2006) http://www.fwtm.freiburg.de/servlet/PB/menu/1174649_l2/index.html visited July 12, 2013	The city's Land Use Plan 2020, which aims to reduce land use as far as possible by focusing on Freiburg's internal development while limiting or controlling development outside of the city center.		Public information Campaign, e.g. with material that served as a basis for the participants in the public dialogue: - a contact person for each issue was assigned; - all specific land areas were described through short fact sheets; - several issues of the local newspaper reviewed land use scenarios - all expert opinions were available on the Internet and; visionary objectives were used in the communication between civil population and local government.	The city's Land Use Plan 2020 is novel in that it prioritizes landscape protection over building. It includes about 30 hectares less building space than was previously available and provided cool air corridors.

City of Freiburg	Motivations	Roles per stage	Rationale
Hierarchical governance	- Open space - High temperatures - Flooding - Percolation water through the soil - Ecological compatibility Social	The Land Use Plan 2020 is regarded as a successful example of civic participation in municipal processes. In 2003, civic groups defined some visionary	

	justice - Economic viability	objectives, which, one year later, were included by the municipal Council as framework conditions of the Land Use Plan 2020, addressing ecological compatibility, social justice and economic viability. In 2005, citizens formed 19 working groups to discuss every potential construction area of the Land Use Plan 2020. Upon defining key points of the Plan, the municipal Council reoriented its decision, based on the outcome of these discussions.	

	Green space		
City of Berlin	Legal instruments	Economic instruments	Communication instruments
(Kazmierczak and Carter 2010)	Biotope Area Factor (BAF); plans for the development of new buildings have to leave a certain proportion of the development area as a green space. The BAF has legally binding force in Landscape Plans for selected parts of the city. Their binding nature as statutory instruments gives Landscape Plans a strong political, administrative and public mandate. An important advantage of the BAF	A system of fees and regulations.	Internet; information is aimed at both the interested layman and the professional public, in several languages and updated on a regular basis. A database of maps presenting environmental conditions in the city and land use characteristics, e.g. climatic zones, air temperature, humidity and soil moisture.

	regulation is that it allows flexibility of the site design; the developer may decide what green space measures are applied, and where, as long as the required green space ratio is achieved. Provision of green spaces is supported by national legislation. In the German constitution, there is a clause about private property owners having responsibilities for promoting social good (Ngan 2004). This means that property owners have a responsibility to the greater community to provide green space.[2]		

City of Berlin	Motivations	Roles per stage	Rationale
Hierarchical governance	- Biodiversity - Open space - High temperatures - Urban flooding	The unique opportunity to develop the vast central area of the city after the reunification of East and West Berlin provided a testing ground for innovative large-scale green infrastructure projects. The Landscape Pro-	The BAF contributes to standardizing and putting into practice the following environmental quality goals: - Safeguarding and improving the microclimate and atmospheric hygiene

[2] In Germany, green space policies can be supported by the 'German Intervention Rule', which is based on sections of the Federal Building Code, along with parts of the Federal Nature Conservation Act. In essence interventions (intrusions) on nature or the landscape require compensation measures (counterbalances). Green roofs and green space are recognized as compensation measures in many municipalities (Ngan, 2004).

		gram for West Berlin was introduced in 1984. At that time, nature conservation was a priority for almost all political parties. The plans responded to the need to encourage more green space areas to be developed in densely built-up urban locations.	- Safeguarding and developing soil function and water balance - Creating and enhancing the quality of plant and animal habitats - Improving the residential environment
Local authorities		Discussions between staff from Berlin's Landscape Planning and Town Planning departments helped to develop new classifications (e.g. for environmental mitigation and replacement measures) in the Landscape Program. Cross-departmental working also helped to develop a better mutual understanding of the various laws applicable to green spaces.	

	Green space			
City of Faenza	Legal instruments	Economic instruments	Communication instruments	Results
(Kazmierczak and Carter 2010)		Bio-neighborhood incentive program ("Municipal Rule of Green") included in Town Planning Regulations; incentive scheme for developers to incorporate sustainable practices in	Negotiations between the developers and the municipality. Promoting of - Water retention by water metering and technical devices reducing the waste of water and re-	As of 2010, two bio-neighborhoods have been developed including a total of 500 apartments in 250 private property units. These bio-neighborhoods meet green

		building design. Developers may create buildings of a larger volume if they minimize land consumption by concentrating the development in one part of the plot of land. It includes flexible rules and cooperation with citizens. The project was funded by Municipal and Regional Funds.	use of grey water. - Systems of rainwater collection, filtering and storage - High quality design of courtyards and communal areas. Engagement of Faenza residents by - "Faenza 2010 - The City We Want", an awareness raising campaign that started in 1998; - Awarding “Blue stickers” for cars and heating systems, which highlights the adherence to fuel- and energy-use standards; - “City Center by bike” transport initiative.	building criteria, requirements for permeable surfaces and rainwater recovery, and the reduction of noise pollution. Due to the improvement in town quality, the population of Faenza has grown by 6%. The lack of set standards encourages developers to search for and implement innovative solutions to the design of the buildings and the surrounding area. Similar incentive systems are now being used in other municipalities in the region. Furthermore, the negotiations between the developers and the municipality based around flexible rules are less time consuming than the process of checking adherence to rigid building standards. Reduced time of obtaining building permits encourages developers to invest in Faenza.

City of Faenza	Motivations	Roles per stage	Rationale
Hierarchical governance	- Urban quality - Urban sustainability - Nature protection	In 1999, the Municipality of Faenza joined the national project “Agenda 21” for urban	Key issues taken into account in the preparation of the 1999 Town Planning Regulations were protec-

	- Archeological site protection - Well-being - Social economic development - Open spaces - Water storage - High temperatures - Microclimate conditions - Energy	areas: a pilot initiative with regard to sustainable development involving some small-medium sized cities in Italy. This helped to promote development rules and practices based on the direct involvement of developers and citizens in the urban design process. The municipal administration of Faenza was the leading actor in the development of the initiative. Main stakeholders are the developers, or groups of individual citizens, who want to construct a bio-neighborhood. The Town Planning Regulations 1999 included an incentive scheme for developers to incorporate sustainable practices in building design. This approach was confirmed and extended by the Municipal Structural Plan in 2009. The municipal Administration of Faenza has the power to assess, upon completion of the development project, whether the developer has actually followed the approved design of	tion of the historic and natural features of the area, protection of archeological sites, protection and creation of open spaces. The incentive program aims to achieve energy savings, promote aesthetic qualities of neighborhoods, and also create better microclimate conditions to prepare for future rising temperatures associated with climate change.

		the plan.		

	Green space			
City of Malmö (Augustenborg)	Legal instruments	Economic instruments	Communication instruments	Results
(Kazmierczak and Carter 2010) http://www.malmo.se/English/Sustainable-City-Development/PDF-archive/pagefiles/AugustenborgBroschyr_ENG_V6_Original-Small.pdf, visited July 12, 2013.	The Malmo Municipal Housing Company (MKB Malmo Kommunila Bostadsbolag) and the City of Malmö agreed a joint management contract for the waste, water and green space systems. It includes Sustainable Urban Drainage Systems (SUDS) with ditches, retention ponds, green roofs and green spaces and a storm water system.	Around half of the sum was invested by MKB. Remaining funding came from the local authorities, principally the City of Malmö, in addition to several other national and EU sources. Management work is jointly funded through the housing company, which incorporates costs into rents, the water board through the water rates, and the city council's standard maintenance budgets.	The Augustenborg project incorporated extensive public consultation. This included regular meetings, community workshops, and informal gatherings at sports and cultural events. The approach became increasingly open and consultative. Constant communication and in-depth community involvement enabled the project to accommodate residents' concerns and preferences regarding the design of the storm water system. Consequently, the project encountered little opposition. The greatest challenge in involving the public was maintaining continuity, which involved keeping a steady focus on the environmental awareness of the residents and informing the newcomers to the area about what had been done.	The volume of storm water draining into the combined system is now negligible, and this system now drains almost only wastewater. Runoff volume is reduced by about 20% compared to the conventional system. The rainwater runoff rates have decreased by half. There have not been any floods in the area since the open storm water system was installed, which was designed to accommodate a 15 year rainfall event as the baseline. Overall green space has increased 50 per cent, attracting small wildlife and increasing biodiversity by 50 per cent. Between 1998 and 2002 the following social changes have occurred: - Turnover of tenancies decreased by 50%; - Unemployment fell from 30% to 6% (to Malmö's average);

				- Participation in elections increased from 54% to 79%. Augustenborg has a recycling rate of over 50 per cent compliance and includes food composting. As a direct result of the Ekostaden project, three new local companies have started: Watreco (working with open storm water management), the Green Roof Institute and Skåne's Car Pool.

City of Malmö (Augustenborg)	Motivations	Roles per stage	Rationale
Local authorities	Create a more socially, economically, and environmentally sustainable neighborhood and minimize flood risk	The process of creation of Ekostaden Augustenborg began in 1997, and was started by discussions about closing down a nearby industrial area. The Service Department, City of Malmö, suggested that an eco-friendly industrial park opened in the area. The key actors involved in the regeneration of Augustenborg were the MKB housing company and the City of Malmö, represented by the Fosie district and the Service Department . How-	Augustenborg was prone to annual flooding caused by the old sewage drainage system being unable to cope with the combination of rainwater run-off, household waste water and pressure from other parts of the city. The neighborhood of Augustenborg (Malmö, Sweden) has experienced periods of socio-economic decline in recent decades, and frequently suffered from floods caused by overflowing drainage systems. Climate change projections included increased numbers of days with high tempera-

		ever, several individuals were particularly important to the success of the project. The process of creation of Ekostaden Augustenborg began in 1997, and was started by discussions about closing down a nearby industrial area. Someone from The Service Department, City of Malmö, suggested that an eco-friendly industrial park opened in the area. At the same time a former headmaster at the school in Augustenborg, had become one of the coordinators of the Swedish Urban Program in Malmö. He contacted the MKB housing manager for Augustenborg and had the mission to renew the area. The three men gathered a group of senior officers, colleagues and active residents in the area who all wanted to turn the area into a sustainable district of Malmö. A project leader, with experience from Groundwork in England, was hired in 1998. Residents and people working in Augustenborg were involved in	tures and more heavy rains, which were expected to exacerbate existing problems. In addition, waste management and biodiversity improvement were important drivers. This project also involved initiatives aiming at improvement of energy efficiency and energy production, electric public transport and carpooling, and recycling.

		the design of the outdoor environment. Augustenborg school pupils were involved in a number of local developments, for example with the planning of a new community/school garden, rainwater collection pond/ice rink, a musical playground, and sustainable building projects incorporating green roofs and solar energy panels.	
Interactive governance		As the project progressed, local businesses, schools and the industrial estate became involved. The joint management contract is an example of interactive governance. The Botanical Roof Garden was developed in a partnership with several universities and private companies.	

	Green space			
City of Linz	Legal instruments	Economic instruments	Communication instruments	Results
(Treberspurg 2008; Pötz and Bleuzé 2012) http://www.linz.at/english/life/3199.asp, visited July 12th, 2013.			Famous designers were hired and competitions were issued for architecture, energy and water concepts. A book about the project has been published.	Solar City; an urban settlement for 3.000 - 4.000 people in the immediate proximity of a sensitive, unique natural landscape. An attractive open space of 20 hectares parkland with high

				recreational value in and around Solar City has been realized. A sunbathing lawn adjoining a swimming area is realized. The Landscape Park is a transitional filter between the residential area and the natural landscape. This basic structure has been filled with a variety of facilities, such as playgrounds, an area for fairs or other large gatherings, and a constructed wetland for wastewater treatment. The Aumühlbach Stream was completed in 2005. Since April 2004, water has again flowed freely through the 4.2-kilometer streambed. A total of 1500 new trees have been planted in the parkland and along the Aumühlbach Stream.

City of Linz	Motivations	Roles per stage	Rationale
Hierarchical governance	- Biodiversity - Social economic situation - Air pollution - Energy - economic growth - Housing demand	Municipal administrators took the initiative and hired quality design partners. The municipality made the initial investments and controlled the whole process.	The municipal government of Linz, aware of the unquestionably dramatic ecological changes taking place on our planet, decided to embark on new paths by means of concrete projects that would develop and showcase new solutions and

			help them to get accept- ed. Another reason for focusing on the issue of residential construction was the enormous demand for housing, above all affordable dwell- ings for low and middle income earners. An estimated 12,000 per- sons were looking for apartments in Linz at that time. A large number of people working in Linz lived outside the city limits. Therefore, a further aim was more housing inside the city in order to reduce commuter traffic.
Interactive governance		In 1994, the City of Linz, to- gether with four of the most important non-profit-making residential construction organi- zations in Linz confirmed their willingness to finance the plan- ning and development of a model estate of 630 low energy construction homes in the dis- trict of Pichling.	

	Green space			
City of London (Olympic park and Green Grid)	Legal instruments	Economic instruments	Communication instruments	Results
(Greater_London_Authority 2008; Pötz and Bleuzé 2012)	The concept of the East London Green Grid is defined and embed-		Olympic games 2012; The city won the bid in 2005 to host the games	Lee valley park; The park for the Olympics is seen as a cata-

	ded in Local Development Documents. The aim is to connect as many areas of urban vegetation as possible through purchase or zoning changes.		because it submitted an ambitious plan to make the event more efficient and less wasteful.	lyst that will improve the green grids in the Lee Valley. It is a green zone about 40 km and 61 hectares of new parkland. The delivery of the East London Green Grid vision is a complex and challenging task. It will be a long-term and evolutionary process requiring strong political support at all levels, national, regional and local. This can best be achieved through the adoption of appropriate policies by boroughs in their Local Development Frameworks (LDFs).

City of London	Motivations	Roles per stage	Rationale
Hierarchical governance	- Health effects - Dryness, drinking water - Increased risk problems with insects - High temperatures - Air quality - Recreation - Community cohesion - Reduction in local crime and anti-social behavior - Biodiversity - Reduction in local traffic by encouraging pedestrian and cycle	With the publication “A summary for decision makers” in 2006, London put forwarded the concept of heat stress parameter for spatial planning; a starting point of the East London Green Grid project. The purpose of this strategy is to create natural urban systems that support and permit growth. The presence of green structures has been linked directly to the target of healthy urban	Heat waves and their adverse impact on the London economy of the start of 21 century. Prediction is that the heat in 2015 will be the same as in summer of 2003. The green space expansion will improve health and social wellbeing of the residents. Green-blue structures serve explicitly to buffer water, enhance the quality of the air and lower the temperature.

	route use - Flood risk - For Olympic park: climate change, reduce waste, biodiversity, support awareness, quality of life	environment. Investment in the Green Grid plan calls for an investment of 250 million pounds by the authorities.	

	Green space			
City of Kalamaria	Legal instruments	Economic instruments	Communication instruments	Results
(Euroconsultants, 2011; European Environment Agency, 2012)		Kalamaria participated in the Grabs-project, financed by the EU, and developed an adaptation action plan.		The cross-departmental and multi-stakeholder process brought different perspectives and types of experience to the adaptation action plan. They improved the understanding of climate change impacts across stakeholders and, as a co-benefit, helped to established long-term collaboration which otherwise would not have taken place.

City of Kalamaria	Motivations	Roles per stage	Rationale
Local authorities	Climate Change: the use of green and blue spaces as adaptation measures	The city started with an internal SWOT analysis (strengths, weaknesses, opportunities and threats). It involved interviews with personnel of the Department of the Land Registry Office and Municipal Property, the	

		Department of Technical Works, Maintenance and Environment, the Planning Department; the Department of Greenery and the Office of Protection of the Environment. A cross-departmental climate change monitoring task force led to the development of an action plan with clear roles for all stake-holders. The adaptation action plan was also developed in collaboration with a number of external stakeholders. The task force will monitor and evaluate the implementation and then report to the mayor.	

	Urban agriculture			
City of Manchester	Legal instruments	Economic instruments	Communication instruments	Results
(Karner 2010)		Local Exchange Trading Sys-tem(LETS). This provides an indirect barter system for an alternative economy. They are basically social trading net-works, means for people who define networks to exchange goods and services without using cash. There was a big LETS system in Manchester with	Manchester Community Strategy (2006-2015) sets out how public services will be improved, especial-ly a vision for 'making Manchester more sustainable' by 2015. It in-cluded wide social mobilization.	Manchester's agri-food activities are not entirely measurable in terms of conventional 'value chains' or even money. It is seen as providing unique 'community spaces' which con-tribute significantly to the envi-ronmental and economic sus-tainability of the region, espe-cially by recycling money and

		about 600 people trading in it.		human resources for community development.

City of Manchester	Motivations	Roles per stage	Rationale
Local authorities	- A culture of good food in the city; wide access to healthy, sustainably produced food. - Exercise - Social economic situation	Support bodies for food initiatives Manchester Environmental Resource Centre (MERCi) was established with funding from the National Lottery in 1996 with the aim of making Manchester more sustain. Minimal financial support, mainly from local authorities and private foundations, has generated food projects that are dependent on a few paid posts. Public funds support collaborative projects among community groups to develop more allotment sites, some used for training in organic production methods.	Socio-economic inequalities and social exclusion are contributing to rising health problems, including obesity. Some parts of the city are known as 'food deserts', where residents have little access to healthy food. Urban redevelopment favoring supermarket chains has been blamed for these problems. By setting up local food production, it's a way of getting people to have exercise and engage with each other. It's social integration. And they get to grow food and eat healthy food. It's a way for people who don't have very much money to have access to affordable health organic food.
Market governance		Herbie Van's shop Photo: Manchester Food Futures able, and has stimulated many food projects addressing societal problems.	
Interactive governance		Manchester Food Futures (MFF) is a partnership of Manchester City Council, the National	

		Health Service, community voluntary and private sector groups. Manchester Community Strategy (2006-2015) sets out how public services will be improved, especially a vision for 'making Manchester more sustainable' by 2015. It includes local food initiatives, which provide broader access to healthy, fresh food. Diverse actors carry out the initiatives, including for-profit businesses, voluntary (or charitable) organizations, grassroots projects, social enterprises and official bodies.	

	Urban agriculture			
City of Paris	Legal instruments	Economic instruments	Communication instruments	Results
(Jonkhof, Philippa et al. 2012; Pötz and Bleuzé 2012)	Municipality makes available a duration of five years, a period that could be extended according to urban development. The green hand pact ('Main Verte') signed by the neighborhood association and the local authorities , puts in place constraints such as weekly opening, public events organization management plan			70 jardins partagés have been created within 10 years and cover a varied archipelago of individuals as generations, social backgrounds, cultures, and origins.

	creation and communications, and juridical warrants.			

City of Paris	Motivations	Roles per stage	Rationale
Local authorities	- Education - Social connections	Meeting an increasing demand from local citizens, the municipal program of Paris so-called 'Main Verte' (equivalent to Green Thumb in New York) has been set up at the turn of the twenty first century. This new, urban space-sharing form of gardening draws its inspiration from the New York and Montreal 'community gardens'. The Municipality makes available and cleans up plots, guarantees water supply and garden enclosing. Amateur gardeners adhere in return to specific environmental guidelines, rainwater for irrigation, organic gardening and material recycling.	Beyond providing accessible green space in the city and improving environmental quality, jardins partagés provide new social and cultural hubs. Jardins partagés are a tool to transmit knowledge and traditions; some of the gardens integrate social and professional inclusion programs, educational plots reserved for schools and therapeutic gardening. The great enthusiasm of the Parisian reflects the need to provide gardens in urban space remodeling. A way to revent the city and showing that ephemeral actions are crucial for a more sustainable city organization.

	Urban agriculture			
City of Lyon	Legal instruments	Economic instruments	Communication instruments	Results
(Jonkhof, Philippa et al. 2012) http://www.sustainable-everyday-project.net/urbact-	Community gardens in Lyon are part of the green zoning plan of the *Urban Community of the Grand*		Media, local papers and the Internet have been used to attract participants.	Up to 30 gardens across Lyon with varying goals (see below) have been realized. A careful

sustainable-food/2012/09/25/opportunities-and-challenges-5/, visited August 15, 2013.	*Lyon* including the city of Lyon and the 58 municipalities around. Participants have to set up a foundation and make arrangements for maintenance, financing etc. with the local authority.			mapping and analysis of all the different experiences has led to a change in the management support by the city to work on the consolidation of existing gardens (to reach financial autonomy and stable participation) before expanding their number.

City of Lyon	Motivations	Roles per stage	Rationale
Local authorities	- Community spirit - Socio-economic inequalities - Education - Food production - Gastronomy - Sustainability		- jardin familial, family garden: to improve family situations in deprived neighborhoods - jardin communautaire, environmental garden: to improve the quality of the living environment - jardin familial traditionel, allotment garden: social activities in greenery - Jardin pédagogique, educational garden: for education and to improve social, physical and cognitive interactions among children and youth - jardin collectif, community gardens: common activities in regular neighborhoods - jardin collectif d'insertion, social gardens: reintegration of de-

			prived groups of people - jardin maraîchage, food production garden
Interactive governance		The *Urban Community of the Grand Lyon* actively promoted urban agriculture. Participants have to set up a foundation. A project manager / liaison officer has been appointed to link the ideas of the participants to the expertise of local governmental bodies. The salary of this professional is part of the financial plan of the garden. Arrangements are made, in which the local government is responsible for financing, allocation of plots and governmental arrangements and the participants are responsible for continuity of their foundation, engagement and commitment, quality of the design and maintenance schedules. A comprehensive financial plan from both participants and government is obliged, including costs of design, earnings, water and waste services etcetera. The gardens are laid out by the	

		participants, after the definition of the goal and target group of the garden and according to the corresponding typology.	

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Bijlage 2: Rol nationaal en internationaal beleid

EEA REPORT (European_Environment_Agency 2012);

- Urban adaptation relies on action beyond cities' borders' ; e.g. cities facing flooding due to inappropriate land use and flood management in upstream regions.
- **Support from a national and European framework is crucial in assisting cities to adapt.** Cities and regional administrations need to establish grey and green infrastructures and soft local measures themselves. National and European policy frameworks can enable or speed up local adaptation thus making it more efficient. Supportive frameworks could comprise of:
  - sufficient and tailored funding of local action;
  - mainstreaming adaptation and local concerns into different policy areas to ensure coherence;
  - making the legal framework and budgets climate-proof;
  - setting an institutional framework to facilitate cooperation between stakeholders across sectors and levels;
  - providing suitable knowledge and capacities for local action.
- Few European regulations refer to adaptation; e.g. in water and flood risk management, agriculture and rural development, health, and nature protection and biodiversity (table 2). A higher potential exists. One proposal linked to the European Union's structural funds for the period 2014–2020 states that project spending requires the existence of disaster risk assessments taking into account climate change adaptation as conditionality. It will ensure that expensive and long-lasting infrastructures are able to cope with future climate changes. In addition the proposal for the Multiannual Financial Framework (MFF) 2014–2020 requests that the budget for climate change is sourced from different policy sectors forcing policy mainstreaming and coherence.
- Most current EU policy strategies only target single or possibly dual policy goals (table 3). With a more integrated and holistic approach, many of these policy tools could be adapted to address a much broader range of policy interests. An extensive revision of EU policy in the direction of ecosystem preservation, improvement and creation is needed, according to Ellison (Ellison 2010). He argues that a EU Climate Change Commission should be installed to coordinate policy goals (1) across issues areas (e.g., energy, agriculture, water and land use) and (2) across individual Member States.
- The European Commission is developing a strategy for an EU-wide green infrastructure as part of its post-2010 biodiversity policy. This would include not only areas falling under the remit of Natura 2000 (EC, 1992) but also urban green areas, green roofs and walls supporting biodiversity as well as climate change adaptation.
- Perhaps the most relevant for urban areas is the EU's cohesion policy with its related structural funds which comprise a substantial part of the EU budget. The funds hold the potential to support specific adaptation projects in cities and regions. For example, urban renewal projects can actively consider climate change by providing sufficient green infrastructure.
- The development and implementation of the European climate change adaptation strategy for 2013 offers a unique opportunity to create a joint, multi-level approach and reflects efforts cities have made in recent years to

be part of related EU policy. The European Commission started a project in 2011 to support urban adaptation strategies (eucities-adapt.eu, Rotterdam as ‘peer city’, final conference June 3, 2013).

Adaptation policy at national level

EEA report:

- National governments provide the crucial link between EU priorities and local adaptation action, e.g. by providing National adaptation strategies (NAS). Biesbroek concludes in his comparison of NAS (see table XX) that in most cases approaches for implementing and evaluating the strategies are yet to be defined (Biesbroek, Swart et al. 2010).
- Sometimes a gap between local, bottom-up adaptation and national adaptation strategies exists. In the case of the Finnish NAS, the national focus undermined regional and local perspectives, making the strategy less interesting for local actors (Juhola, 2010). Sweden and several other countries face similar limitations.
- Multi-level governance is required, i.e. non-hierarchical forms of policymaking, involving public authorities as well as private actors, who operate at different territorial levels, and who realise their interdependence. A dialogue between government levels, private actors and citizens is of particular importance.
- Developing multi-level governance approaches for urban adaptation in Europe needs to consider the diversity of formal governmental systems within Europe. In federal states — such as Germany — regional governments usually have strong decision-making rights. Sweden, although an unitary state, has strong municipal governments holding so called 'local planning monopolies' (Keskitalo, 2010a; PLUREL, 2011). Because cities can decide, relatively independently, on issues related to adaptation, large differences in adaptation policy between the cities in Sweden exist. In the United Kingdom the previous government developed relatively strong central steering on adaptation. National governments can provide the necessary background information and regional climate data, scenarios and assessments. In Germany, for instance, the 'Stadtklimalotse' (urban climate pilot) was developed for this purpose (http://www.stadtklimalotse.net/stadtklimalotse).
- The United Kingdom Climate Impacts Programme (UKCIP) has often been hailed as a success story in providing support for coordination of climate change action across levels. The UKCIP provides a uniform platform for local authorities and for coordination on adaptation in the English regions. It supports bringing local authorities to certain minimum levels of adaptation.
- In a range of countries, urban adaptation still happens in an ad hoc fashion and in isolation. Table 4.5 shows barriers and possible solutions from a multi-level governance approach.
- Another limitation for implementation at the national level relates to the barriers between policy sectors. Without flexible and cross-sectoral coordinated measures, adaptation efforts may be hampered by sectoral thinking.
- National governments also can play a key role in greening urban finance by re-designing sub-national taxes and grants at local government level (OECD, 2010).

Table B2.1: Key barriers to local adaptation and possible multi-level governance responses.

Barrier type	Barriers at local and regional level →	Possible support from a multi-level governance approach	← Barriers at national and European level
Jurisdictional and institutional	Lack of mandate at the subnational level to address adaptation issues and problems of regional coordination between municipalities.	Clear mandates for local authorities, clarity of responsibilities between local, regional, national and European actors; Acceptance of the territorial cohesion approach and the Territorial Agenda.	Narrow interpretations of subsidiarity leaves little room for flexibility.
	Maladapted institutional designs which hinder coordination across relevant issues (vertical/horizontal).	Ensuring policy coherence, establishing mechanisms and incentives for horizontal and vertical coordination, addressing issues of scale and the problems of institutional fit and interplay; Development of the EU adaptation strategy as an opportunity.	Novelty and instability of the adaptation agenda, the EU's role still being developed.
	National or regional laws, rules and regulations lead to maladaptation and increase vulnerability.	Climate proofing/mainstreaming of local adaptation needs into national and European legislation and budgeting; Policy coherence through procedural integration of adaptation, e.g. in SIA, SEA and policy evaluation.	Sectoral policies with vested interests.
Political	Local authorities influenced by particular special interests.	Enforce the applications of the principles of good and democratic governance; Ensure broad public participation.	Authorities influenced by particular special interests.
	Pressure to maintain 'business as usual' development pathways.	Clear signals, including incentives, from national and European to local policy levels, that change is necessary; Articulate, to national and European level, local demand for change based on local adaptation experiences; Using the momentum of extreme weather events and other crises to forward the adaptation agenda.	Pressure groups and political interests emphasise 'business as usual' development pathways.
	Pressures of short-term electoral cycles on effective risk management and long time-lag to reap full adaptation benefits.	Raising awareness for the challenge and urgent need for adaptation — use local pressure where climate change impacts are felt first; At the local level, use integration into long-term national and European processes; Sustained attention on procedural integration of adaptation in monitoring and evaluation efforts.	Adaptation not a priority at national or European level, rather on mitigation, eco-efficiency, innovation and green growth.
	Lack of willingness to accept costs and behavioural change.	Build clear evidence on costs and benefits of adaptation; Communication about early-adapters and best practice; Exchange European-wide knowledge; good practice and dialogue with stakeholders across all levels; Use local pressure to act.	Lack of willingness to accept costs.

Barrier type	Barriers at local and regional level	Possible support from a multi-level governance approach	Barriers at national and European level
Economic and budgetary	Lack of resources or funding to address problems identified.	Climate proofing the budgets at different levels; Provide guidance and support for applicants to EU and national funds; Support the creation of market demand for adaptation; Establish support for local adaptation policies and measures, e.g. through public-private partnerships.	Lack of resources, including immediate challenges of financial austerity.
	Differences between perceived and real costs and benefits.	Improve, exchange and coordinate knowledge across Europe; Grasp the chance for structural improvements in the context of the financial crisis; Search for solutions across levels.	Uncertainty about the costs of climate change; Problems in determining sufficient level of intervention.
	Difficulties mainstreaming adaptation into different budget lines.	Awareness raising and education of stakeholders in other sectors than adaptation; Exchange knowledge and experience with other regions and other level governments; Establish clear guidelines for systematic mainstreaming.	Difficulties mainstreaming adaptation in different budget lines.
	Inter-sectoral competition over budgeting in view of no increase expected.	Need to make an economic case on adaptation — show economic benefits of multi-purpose adaptation measures; Use good practice from elsewhere.	Inter-sectoral competition over the national/European budgeting — no increase expected.
Technical and scientific	Lack of local scale relevant scientific or technical information.	Collect and summarise knowledge and information via central platforms such as the European platform CLIMATE-ADAPT; National and European research aimed at local vulnerability and adaptation, also with high emphasis on practice-oriented results and tools; Exchanges with regional and local knowledge holders; Establish science-policy organisations (boundary organisations) and networks such as regional climate partnerships; Support European climate research through EU instruments (Framework programmes) and national instruments, including joint programming between Member States; Establish and develop monitoring tools for following progress in adaptation strategies and measures (e.g. national reporting comparable to climate policy in mitigation).	Lack of coherent, comparable, up-to date knowledge on national regional and local vulnerabilities and adaptation.
	Inadequate understanding or ignorance of climate risks.	Develop climate change communications programmes and training tools; Make use of communication efforts at other levels; Use of information and training tools provided at internet portals at national and European level like the European platform CLIMATE_ADAPT.	Challenges in communicating climate change effectively.
	Scientific uncertainty; Lack of technical capacity or access to expertise.	Establish across levels common guidelines for vulnerability assessments; Provide support tools and training from national and European levels; Support practice-relevant and academic research and support by boundary organisations.	

Source: Adapted and expanded from Corfee-Morlot et al., 2009; Corfee-Morlot et al., 2010.

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