

Climate information products for users: Examples from the German Climate Service Center

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Geesthacht**

Clima South Workshop

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Different Models of Climate Services

- **Extension of Meteorological Services**
 - Usually focus on physical data and add a dissemination process.
 - **Development by a University or a group of universities**
 - Usually cross departmental groups that are multi-disciplinary.
 - Strong research components, little experience with customers
 - **Development of an expert group by the private Sector**
 - Usually limited experience with climate research
 - Good understanding of the economic and corporate aspects
 - **Creation of a new institution**
 - Very few cases with no prior existence - CSC is one of the few cases
-



CSC in a Nutshell

- Created as part of the **Hightech-Strategy for protection against climate change** of the German Federal Government
- Initially funded by the **Federal Ministry of Education and Research** (2009-till May2014) and will continue on a permanent basis in the Helmholtz Association.
- Located in **Hamburg**
- Today **34 staff-members** plus 11 permanent guest scientist
- **Strong partnership** with world-class scientific institutions in Germany and abroad



CSC: Mission, Vision, Values

Mission

CSC offers products, advisory services and decision-relevant knowledge based on sound scientific knowledge in order to support government, administration and business in their efforts to adapt to climate change.

Vision

CSC is a central node of a national network that provides and disseminates knowledge on climate change.

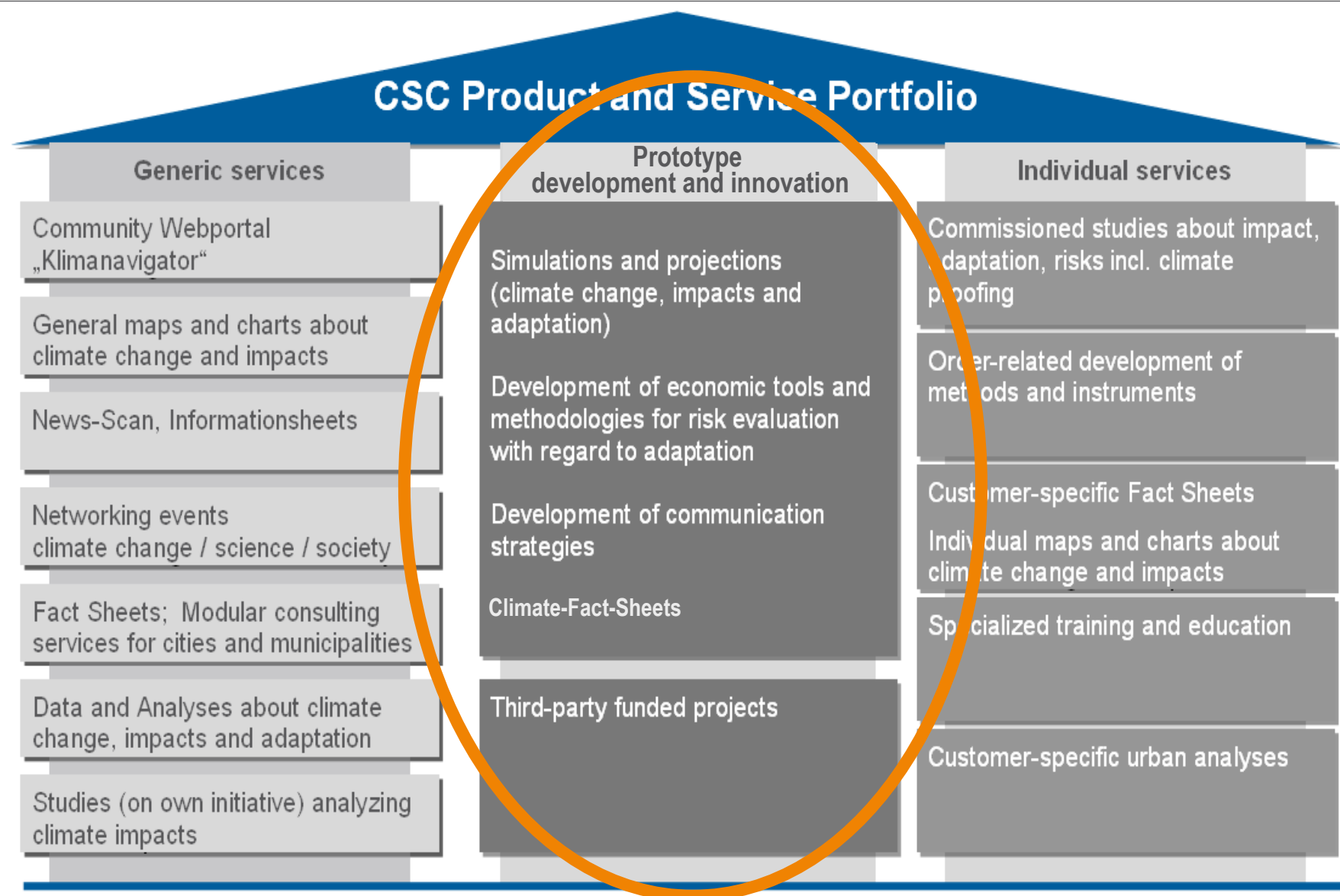
Values

- Interdisciplinary acquisition of knowledge: based on existing knowledge
 - Transformation of knowledge into services: transparent and „best practice“
 - Benefits in terms of common interest: essential criterion
 - Communication with respect to uncertainties: actively pursued
 - Establishment and maintaining of corresponding networks: central task
-

Why is there a need for climate services?

- Not many customers require generic data from a large database. They require analyses and expert judgment using data and other information.
- The customers require information about the robustness of the data and information about uncertainties.
- Local knowledge is an important aspect.

- **Generic products and services:**
 - Freely available products and services, free of charge
- **Prototype development and innovation:**
 - Methodologies, instruments and skills, for (1) conception and development for climate services, (2) generation of new products and services (prototypes) and (3) improvement of knowledge transfer and communication
 - Development process either within CSC initiated activities or within externally funded projects, e.g. BMBF, GIZ, EU
- **Customer specific individual services:**
 - Against retribution



Regional climate simulations

Example for: Prototype development and innovation

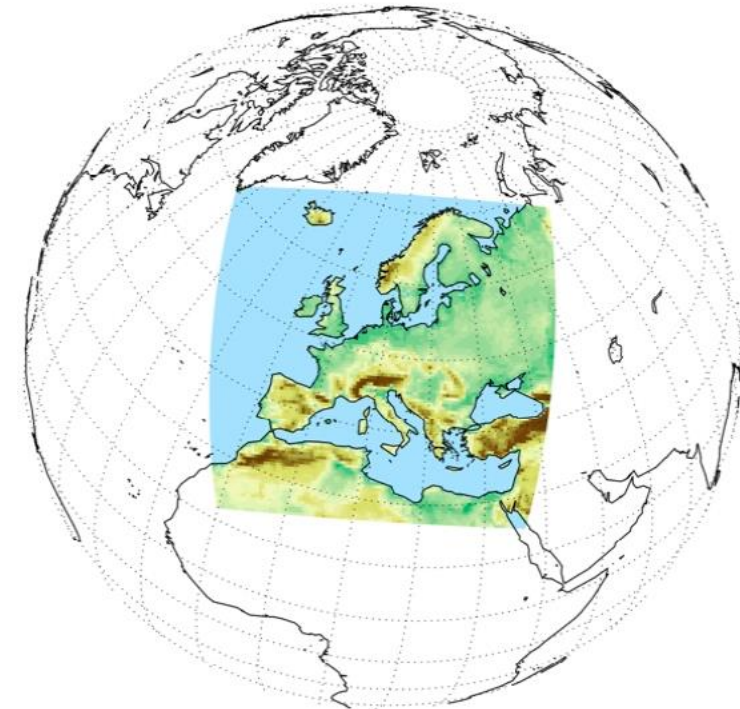
CSC actively participates in the Coordinated Regional Climate Downscaling Experiment (CORDEX)

- Conduct simulations over 8 different CORDEX domains



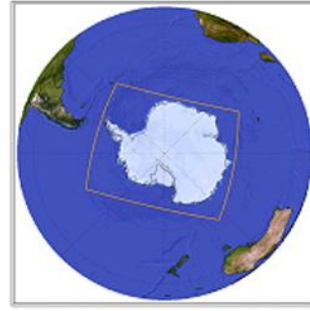
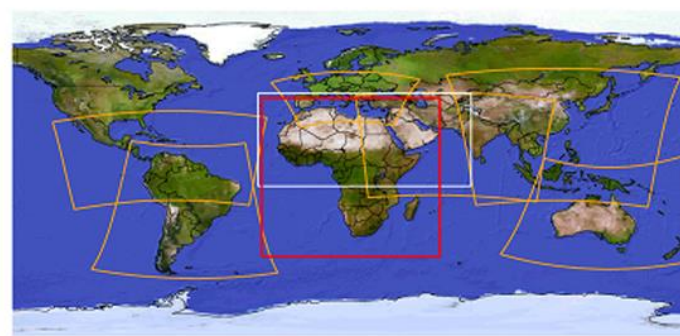
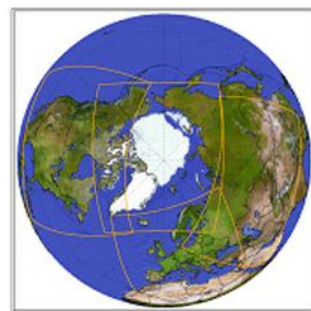
CSC coordinates EURO-CORDEX in cooperation with the Wegener Center in Graz

- EURO-CORDEX Community consists of 26 modeling groups in Europe
- Focus is on the European aspects of the CORDEX Initiative
- Common evaluation and analysis of the climate projections.
- Interface with users.



CORDEX simulations with REMO

CORDEX Domains	Evaluation (1989-2008)	Historical (1949-2005)	RCP2.6 (2006-2100)	RCP4.5 (2006-2100)	RCP8.5 (2006-2100)
Europe (0.11)	✓	✓	✓	✓	✓
Europe (0.44)	✓	✓	✓	✓	✓
Africa (0.44)	✓	✓ ✓	✓ ✓	✓ ✓	✓ ✓
West Asia (0.44)	✓	✓ ✓	✓	✓	✓
MENA (0.44)	✓	✓		✓	✓
South America (0.44)	✓	✓	✓	✓	✓
Australia (0.44)	✓				
East Asia (0.44)	✓				
North America (0.44)	✓				



✓ - forced with ERA-INT

✓ - forced with MPI-ESM r1i1p1

✓ - forced with ICHEC_EC-EARTH r12i1p1

Climate signal maps

Example for: Prototype development and innovation

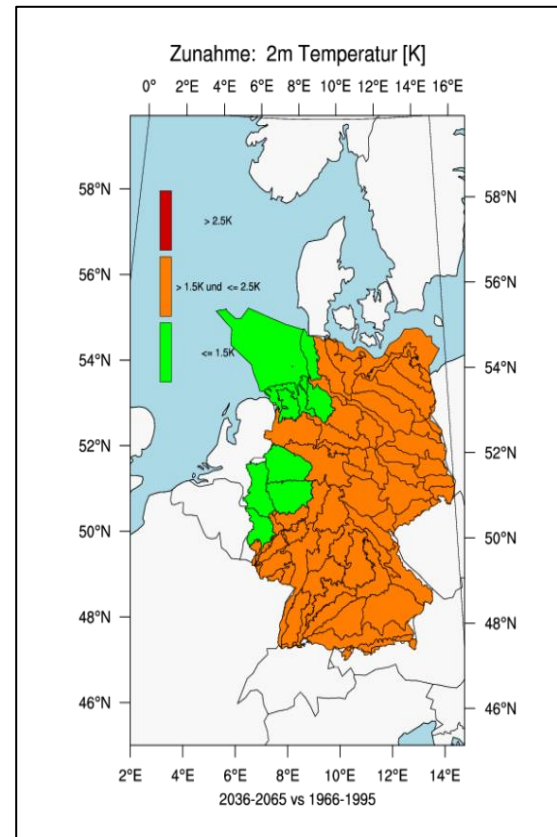
Assessment of robustness of projected regional climate changes

Methode: *state-of-the-art* **Ensemble or regional climate projections** (~30 simulations)

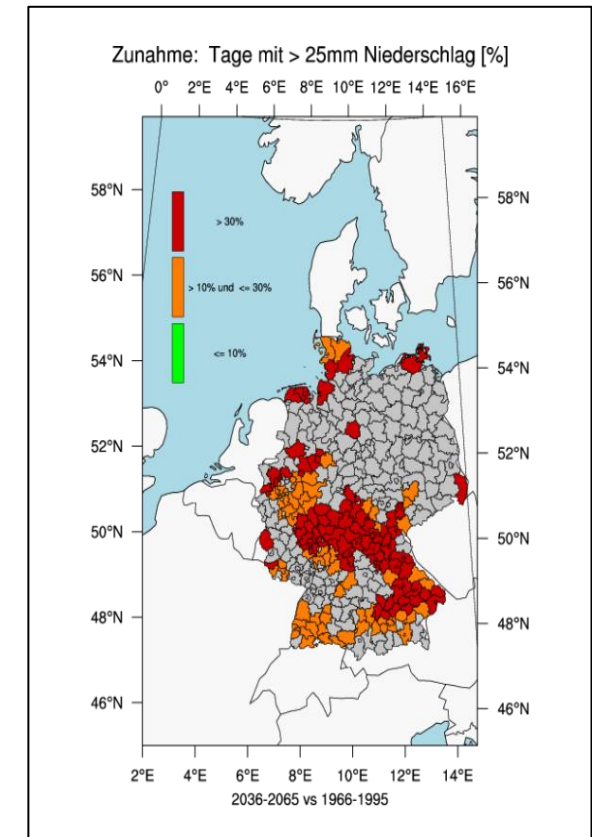
three-level robustness test:

- Agreement of projections
- Significance of projected changes
- Small sensitivity to minor shifts in the reference and projection time periods

Depicted time horizon: 2036 – 2065,
Thresholds, parameters, regions, time-horizons etc. can be adjusted to the user needs



2m-temperature: All regions show robust changes



Days with more than 25mm precipitation: All regions that failed at least one robustness test are colored in grey

Climate-Fact-Sheets

Example for: Prototype development and innovation

Example pages of the Climate-Fact-Sheet for Pakistan



Current climate

Observed mean values are taken from literature and available global data sets (averaged over the whole country):

- Major climate zones (see also climate diagrams - CD1-3): Northern half of the country is semi-arid (BSn - see CD2) to humid (Cfa - see CD1). Southern half of Pakistan is mostly arid to hyper arid (BWh - see CD3).
- Annual mean temperature: ~20 °C
- Annual total precipitation: ~300 mm/yr
- Annual mean actual evaporation: ~300 mm/yr (Annual mean potential evaporation is ~1900 mm/yr)
- Annual mean climatic water balance: ~0 mm/yr
- Intensity of heavy rain events*: 3.1 mm/day
- Mean duration of dry spells*: 115 days
- Mean duration of heavy spells*: 9 days
- Mean duration of cold spells*: 10 days
- Annual mean solar irradiance (surface): 1500 kWh/(m² and yr)
- Annual mean wind speed (10 m above surface): 2.5 m/s

Reported recent extreme events:

- Pakistan was hit by a major flood in 2010 that affected more than 18 million people and had an economic damage of about 9.5 billion US\$.

The climate parameters marked with * are defined in the manual. How to read a Climate-Fact-Sheet at the 95 percent confidence level. The description of the climate zones is based on the Köppen-Geiger climate classification.

Historical climate trends (based on the global CRU data set)

- Spatially averaged over the whole country mean annual temperature has slightly increased by approximately 0.6 °C since the beginning of the 20th century. However this increase is over major parts of the country statistically not significant.
- Significant (above average) annual mean temperature increase has been observed in the south-western provinces.
- A slight decrease in annual mean temperature has been observed in the sub-montane zone and western highlands in the north.
- No. of cold (warm) nights has generally decreased (increased) over Pakistan in the period 1961 to 2000, however a station in the greater Himalayas in the north showed opposite behaviour.

Summary of projected future climate (for the end of the century and combined for all scenarios)

Temperature The median projection of change in annual mean temperature is for an increase of 3.8 °C by 2100, with projected change very likely to fall in the range from 2.1 to 5.1 °C. Confidence in these figures is high. The change in temperature can be considered to be strong. The median projection of change in maximum temperature is for an increase of 3.4 °C by 2100 and in the minimum temperature for an increase of 3.8 °C.

Heatwaves The median projection of change in the duration of long-lasting heatwaves is for an increase of 28 days by 2100, with projected change very likely to fall in the range from 11 to 69 days. Confidence in these figures is medium. The change in the duration of long-lasting heatwaves can be considered to be strong.

Cold spells The median projection of change in the duration of long-lasting cold spells is for a decrease of 4 days by 2100, with projected change very likely to fall in the range from -11 to -1 days. Confidence in these figures is medium. The change in the duration of long-lasting cold spells can be considered to be strong.

Solar irradiance The median projection of change in annual mean solar irradiance is for no substantial change until 2100, with some projections showing an increase and some a decrease. Projected change is very likely to fall in the range from -6 to +1 percent. Confidence in these figures is medium. The change in annual mean solar irradiance can be considered to be weak.

Precipitation The median projection of change in annual total precipitation is for no substantial change until 2100, with some projections showing an increase and some a decrease. Projected change is very likely to fall in the range from -25 to +26 percent. The projected change in precipitation is for a decrease in the first half of the year (January to May - up to -17%) and a slight increase in the second half (up to +12 percent). Confidence in these figures is low. The change in annual total precipitation can be considered to be weak.

Climate-Fact-Sheet Pakistan 2

Legend Statistical information: very likely: light-colored (90 % of model simulations); likely: dark-colored (66 % of model simulations); Median (50 percent-value of model simulations)

Emission scenarios combined all scenarios combined (90 % of model simulations); low scenario (B1) (50 % of model simulations); medium scenario (A1B) (50 % of model simulations); high scenario (A2) (50 % of model simulations)

Projections of possible development of temperature, heatwaves and cold spells

Annual mean temperature

Deg C

2025 2050 2075 2095-100

Signal strength

Confidence

LOW MEDIUM HIGH

Scenario	Measure	Max-Temperature	Min-Temperature
ALL	likely	2.9 to 4.4	2.8 to 6.0
	very likely	1.9 to 0.6	2.1 to 5.8
B1	likely	1.9 to 3.3	2.2 to 3.4
	very likely	1.0 to 4.3	2.1 to 4.3
A1B	likely	2.9 to 4.4	3.2 to 4.8
	very likely	2.0 to 0.6	3.1 to 5.8
A2	likely	3.4 to 4.9	3.8 to 6.2
	very likely	+	+

Cold spells*

- Median projection of change in the duration of long-lasting cold spells is for a decrease of 4 days by 2100.
- Likely range: -8 to -3 days; very likely range: -11 to -1 days
- Separate scenario examination (by 2100):
- Low-Scenario B1: Median -4 days
- High-Scenario A2: Median -6 days

Projections of possible development of solar irradiance

- Median projection of change in solar irradiance is for no substantial change until 2100, with some projections showing an increase and some a decrease.
- Likely range: -3 to 0 percent; very likely range: -6 to +1 percent
- Separate scenario examination (by 2100):
- Low-Scenario B1: Median -1 percent
- High-Scenario A2: Median -2 percent

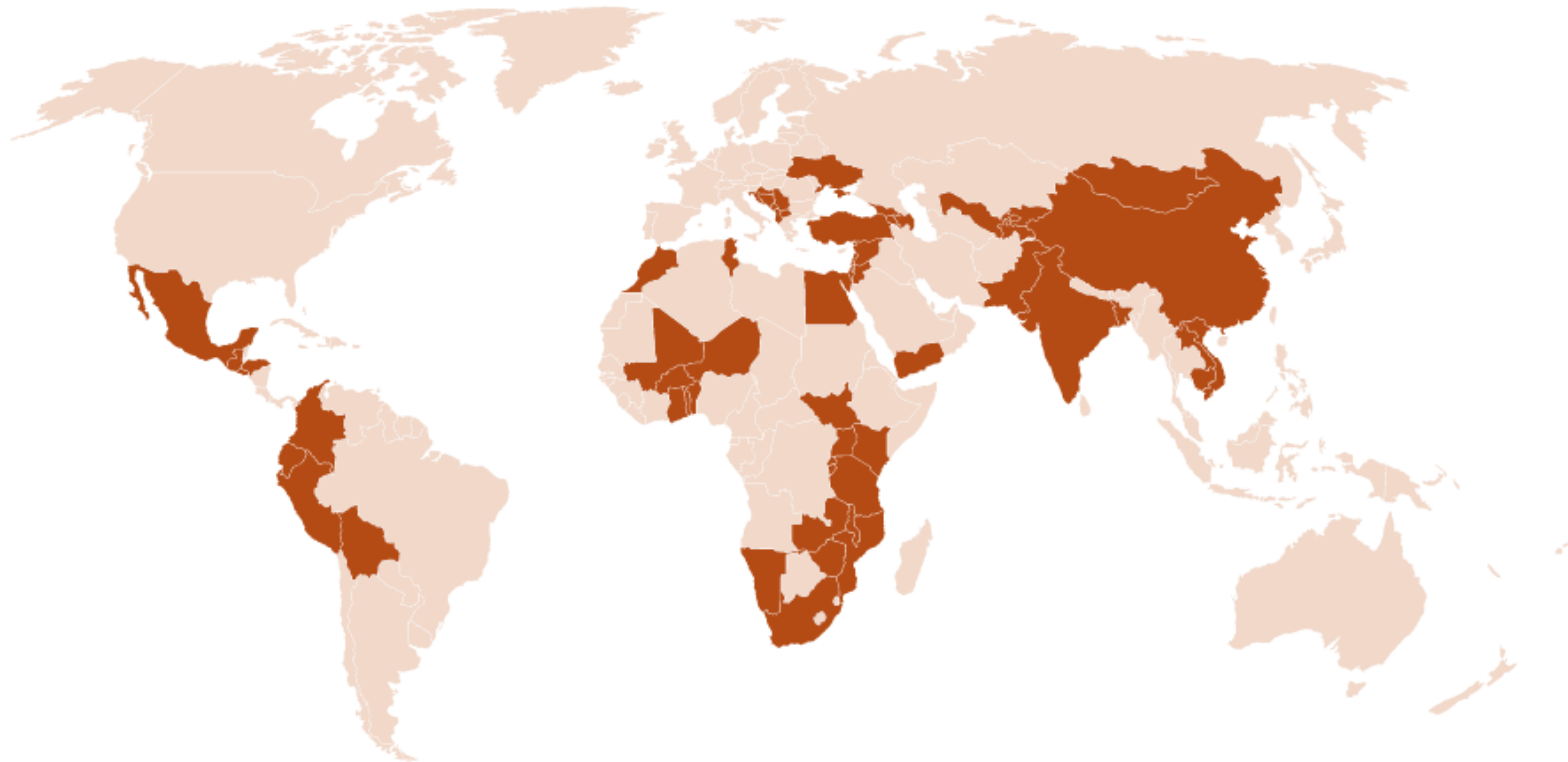
All projected changes presented in the Climate-Fact-Sheet are with respect to the reference period from 1961 to 1990. The evaluation of the signal strength includes not only the actual climate change signal but also the statistical significance of the projected change. The assessment of the confidence in the climate model projections is based on the model's performance in simulating today's climate as well as on the bandwidth of projected climate change. This bandwidth results from the fact that every climate model projects a slightly different climate change signal.

Climate-Fact-Sheet Pakistan 4

Aim: Concise summary of available state-of-the-art climate change information for a country/region

Climate-Fact-Sheets

Example for: Prototype development and innovation



Zurzeit sind Climate-Fact-Sheets für alle markierten Länder verfügbar.
Sie können angefordert werden unter

[www.climate-service-center.de/
climate-fact-sheets](http://www.climate-service-center.de/climate-fact-sheets)



Stadtbaukasten (Tool Box for cities)

Example for: Prototype development and innovation

Climate mitigation
and adaptation

Sustainability

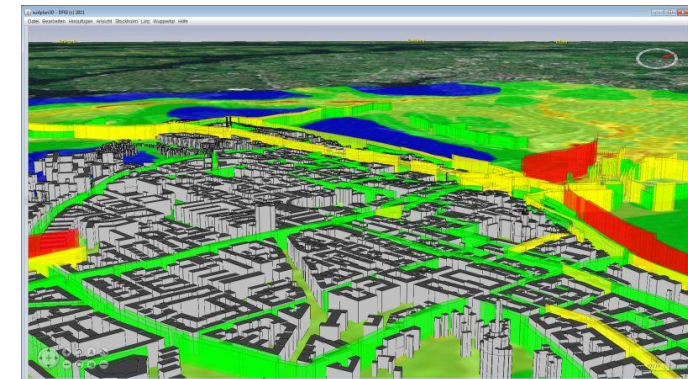
Support for the development of climate-friendly cities.

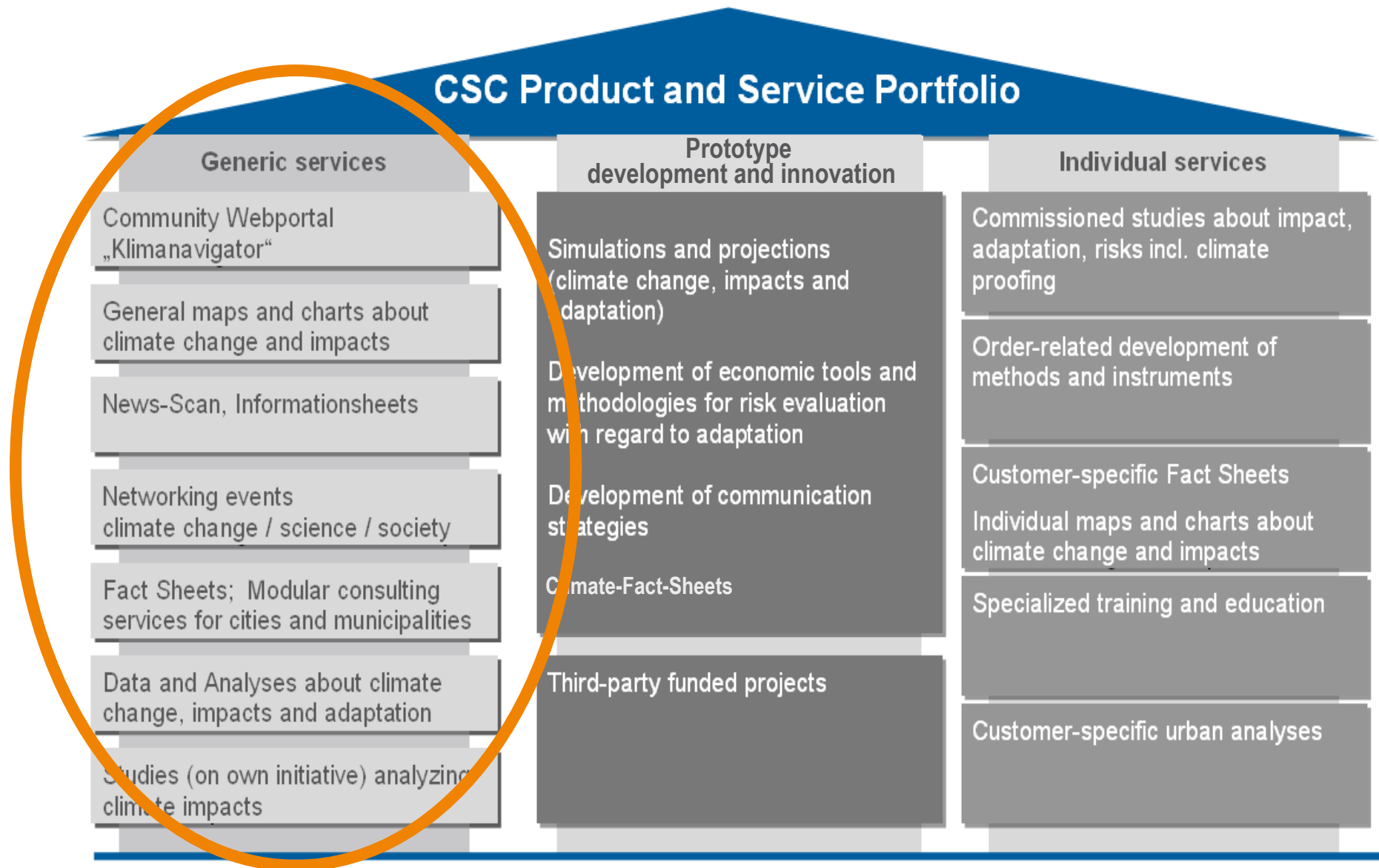
The modules address different issues, e.g.,

1. Monitoring of adaptation and emission budget
2. Introduction of climate aspects in urban planning
3. Use of climate projections
4. Moderation of the participatory process

Project conducted in cooperation with the city of Kiel

STADT
BAUKASTEN





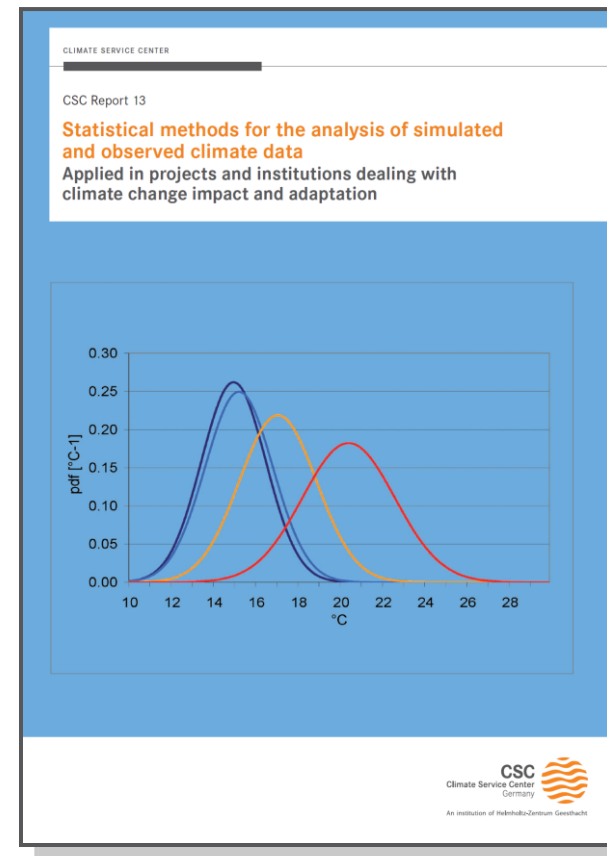
General Guiding Documents

Example for: Generic Services



Glossary

Regularly updated documents with terms used in transdisciplinary climate change research



Brochure on statistical methods

Explanation of commonly used statistical methods and best practice examples for their use in climate change and climate impact and adaptation research

User Interface

Example for: Generic Services

- CSC is developing short documents (20-30 pages) that **translate IPCC results** for different economic sectors.
- The first document focuses on “**climate change and human health**”.
- The effort is led by a scientific communication specialist.
- The document includes
 - The 10 key findings of IPCC re. climate change (WP1)
 - Information about impacts on health
 - Adaptation issues
- The document will be published in May or June 2014.
- It will be distributed to the health community.



Summary of recent research papers related to climate change

- Collection of Interdisciplinary topics
- Short, easily understandable texts with links to the original publication
- Monthly release either via e-mail or via the homepage of the CSC
- about 8.000 regular readers



CSC-News-Scan 7
Dezember 2011

Autoren: Steffen Bender, Markus Groth, Uwe Kehlenbeck, Andreas Kochanowski, Maria Mnez Costa, Susanne Pfeifer, Sandra Pingel
Projektmanger: Maria Mnez Costa **Editor:** Sandra Pingel

Der CSC-News-Scan bietet einen berblick ber die neuesten Forschungsergebnisse zu Klima und Klimawandel sowie deren Folgen. Ergebnisse der Grundlagenforschung zum Klimasystem finden dabei ebenso Bercksichtigung wie Fragen der Energieversorgung, des Klimaschutzes, zu Anpassungsmanahmen oder der Kommunikation der Klimaforschung. Mit dem News-Scan mochte das Climate Service Center Entscheidungstrger aus Politik und Wirtschaft, Wissenschaftler unterschiedlichster Disziplinen sowie interessierte Laien ber aktuelle Ergebnisse aus der Forschung rund um den Klimawandel informieren. Die Original-Verffentlichungen sind jeweils verlinkt, wobei einige Fachpublikationen nicht ffentlich zugnglich sind. Der News-Scan wird jeden Monat per E-Mail verschickt und kann auf www.climate-service-center.de abonniert bzw. abgerufen werden. Fur Anregungen und Kritik senden Sie bitte eine E-Mail an csc-news-scan@hzg.de

Klimapolitik

Kyoto-Protokoll: Ziel verfehlt durch Carbon Leakage?
Im kommenden Jahr endet die aktuelle Verpflichtungsperiode des Kyoto-Protokolls – dem ersten rechtsverbindlichen Abkommen zum Klimaschutz. Groe Emittenten wie die USA haben es bis zuletzt nicht ratifiziert. Doch selbst in den Lndern, die es ratifiziert haben, hat das Protokoll sein Ziel verfehlt, die Emissionen zu senken, so eine Studie des Ifo-Instituts. Die Autoren fuhren dies auf die „indirekten“ Emissionen zurck. Sie entstehen, wenn etwa hierzulande Produkte konsumiert werden, die in Schwellenlndern produziert wurden. So sind die Emissionen in den Lndern, die das Kyoto-Protokoll ratifiziert haben, zwar durchschnittlich um 7% gesunken, aber das Verhltnis zwischen dem Import von CO₂ und inlndischen CO₂-Emissionen ist durchschnittlich um 17% gestiegen. Dies ist ein klares Indiz fur Carbon Leakage, also der Verlagerung von Emissionen. Insofern hatte das Kyoto-Protokoll im besten Fall keinen Einfluss auf die Verminderung des CO₂-Gesamtausstoes der verpflichteten Industrielnder. Manche Einschtzungen der Studie deuten sogar eine Zunahme an. Dies zeigt, dass das Problem des Carbon Leakage nur durch ein globales Abkommen gelst werden kann, das tatschlich alle groen CO₂-Emittenten umfasst. Dies jedoch ist sehr unwahrscheinlich, so dass Handelsstricken, wie Border Tax Adjustments, zunehmend diskutiert werden mussen.
Aichele R., Feibemayr G. (2011), Kyoto and the Carbon Footprint of Nations, Working Paper Ifo No 103.

Klimaschutz

Deutlicher Anstieg der weltweiten CO₂-Emissionen nach der Finanzkrise
Sehr beunruhigende Zahlen liefert eine internationale Gruppe renommierter Wissenschaftler, die sich in dem „Global Carbon Project“ zusammengeschlossen haben. In ihrer jhrlichen Bestandsaufnahme der weltweiten CO₂-Emissionen kommen sie zu dem Ergebnis, dass die durch die Nutzung von fossilen Energietrgern und Zement verursachten CO₂-Emissionen im Jahr 2010 weltweit um 5,9 % angestiegen sind. Dies ist der bislang grote gemessene Anstieg whrend eines Jahres. Insgesamt stellt der Ruckgang der Treibhausgase um 1,4% im Jahr 2009, der maigstch durch die globale Finanzkrise ausgelst wurde, also nur eine kleine Delle mit geringen Auswirkungen auf den langfristigen Trend eines weiter zunehmenden CO₂-Ausstoes dar. Der Anstieg der CO₂-Emissionen im Jahr 2010 wurde vor allem durch die sich entwickelnden Volkswirtschaften forciert (z.B. China + 10,4 % und Indien + 9,4 %). Gleichwohl kam es auch in den Industrielndern zu einem maigsten deutlichen Wachstum (z.B. USA + 4,1 %, Russland + 5,8 % und EU-27 + 2,2 %). Eine Kehrtwende dieser Entwicklung ist derzeit ebenso wenig in Sicht, wie deutliche Verbesserungen der Kohlenstoffintensitt im Rahmen der weltweiten wirtschaftlichen Aktivitten.
Glen P. Peters et al. (2011): Rapid growth in CO₂ emissions after the 2008–2009 global financial crisis, in Nature Climate Change, doi:10.1038/nclimate1332

Empfehlungen zur Weiterentwicklung des EU-Emissionshandels
Die Einfhrung von Emissionszertifikaten und der Handel mit diesen haben bisher nicht unbedingt dazu gefhrt, dass deutsche Unternehmen den Aussto von Treibhausgasen verringern. Vielmehr stellen berschussige Zertifikate sogar eine mgliche Einkommensquelle dar. Zu diesem Ergebnis kommt ein von der britischen NGO „Sandbag Climate Campaign“ erstellte Studie, die die finanziellen Auswirkungen der an deutsche Unternehmen kostenlos und berschssig ausgegebenen CO₂-Zertifikate untersucht. Fur die von 2008 bis 2012 laufende zweite Handelsperiode des Emissionshandels wird erwartet, dass dieses Vorgehen fur die 10 am meisten davon profitierenden Unternehmen zu

ten Wert von 1,1 Milliarden Euro fuhren wird. Einige deutliche Verbesserungen sind fur 2011 bekommen sollte, um seiner Bedeutung Reduzierung des CO₂-Ausstoes in Europa zu Markt zu nehmen und den Handel mit Emissionen zu nutzen.

Wel sich in den Hochgeschwindigkeits-Raumtemperaturen ber 50 Grad Celsius. Die Bahn etwa hat fur ihre neue Zugflotte. Doch wie gut sind Unternehmen generell? Die Autoren sprachen hierzu mit 20 ver- wandelbedingte Herausforderungen. Neben dieser Unter- eingeweiht wurden. Neben dieser Unter- stensmittelproduktion aber auch aus der umgehen.

Unternehmen: Metropolis, Marburg

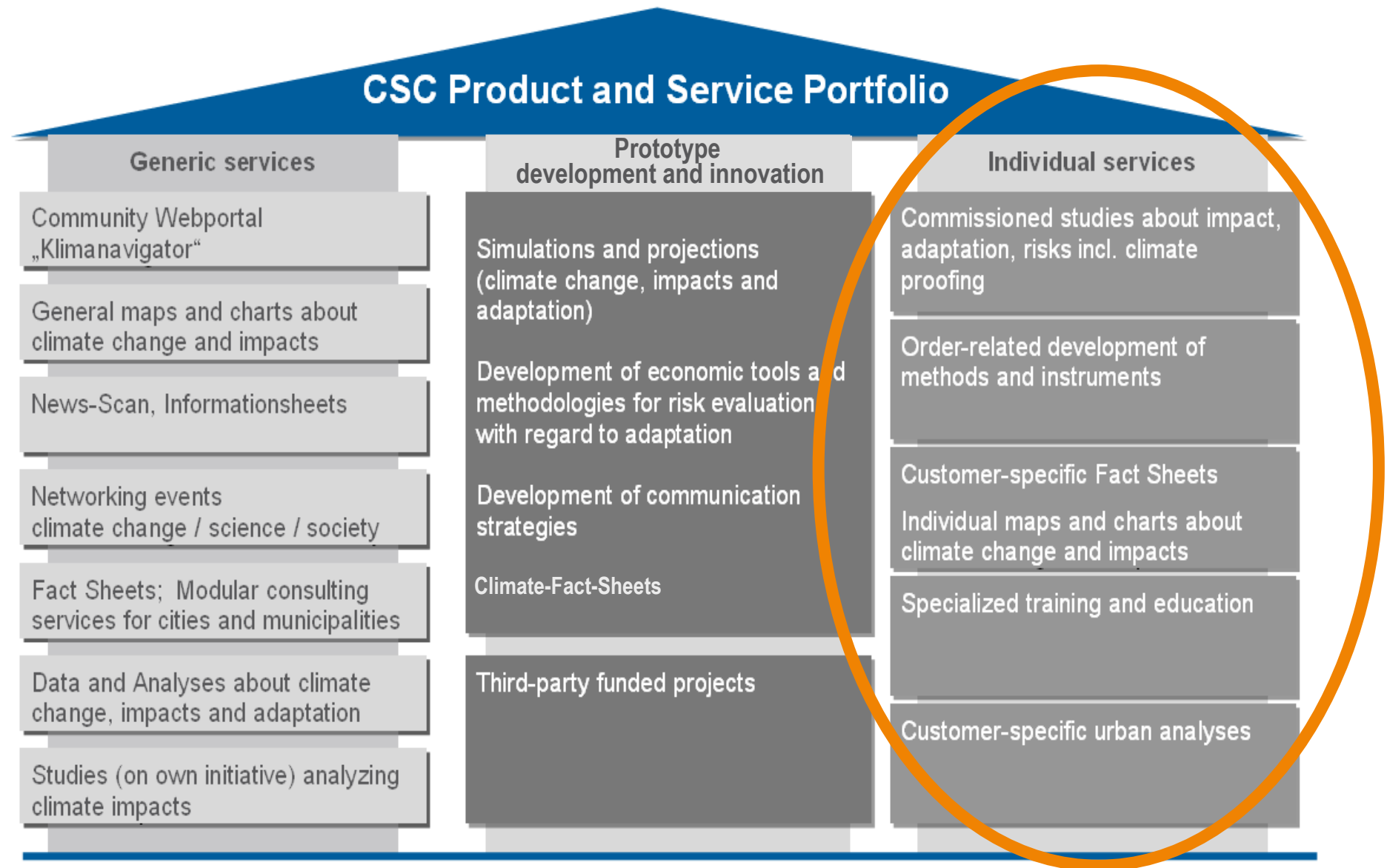
Komm?
fur den Hochwasserschutz der Nieder- in einer aktuellen Studie. Berechnungen henden Anpassungsstrategien auf ihre schaf in Zukunft die Bedrohung durch den Schutz zu gewhrleisten. Wie die und neue Strategien im Hinblick auf die

rop flood protection strategies for a low- kumbers 3-4, 617-645, DOI: 10.1007/

wickelt, mit denen der Zusammenhang scher Ereignisse beschrieben werden Weizenpflanzen und die Weinblute. Sie g ab. Ihr Zeitpunkt variiert daher von zeitig einschtzen zu konnen. Die nun ichter Daten des Weinbaubetriebs der in Weinanbaubereichen und Weinblute durch forte oder zum Wechsel zu klimatisch

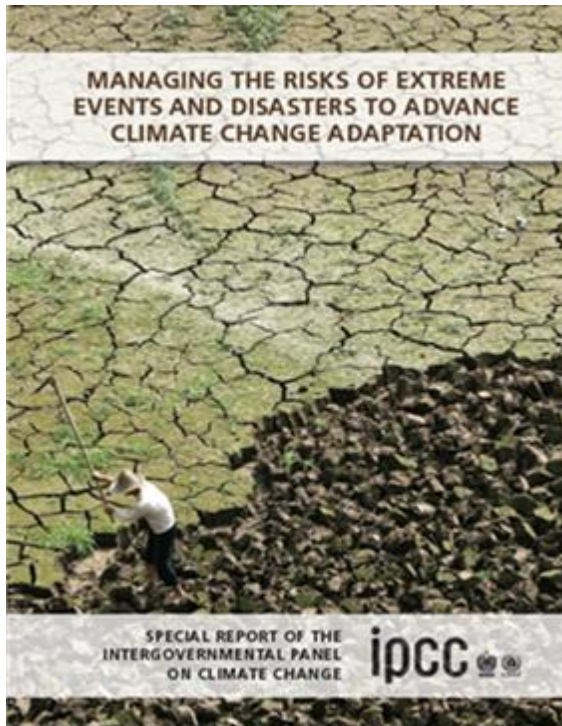
the Upper Moselle region, Climatic

solche Extremniederschlagslage normal gine Studie nach, die Nieder- tlichkeit der Trendentwicklungen von Intensitt der Extremniederschlags Abschnitten in den Messzeitreihen Unterschiede zwischen der Trend- Winter auf. Die Ergebnisse



KfW – Expert Network

Example for: Individual Services



On behalf of

KfW

In cooperation with and behalf of the German development bank KfW

Aims:

- Establishment of a network of international and interdisciplinary experts in the field of climate change, climate impact and adaptation research that can be contacted by the KfW for specific thematic and/or region specific questions, consulting issues
- Development of specific products in order to support the strategic and thematic planning of for the KfW

Interdisciplinary syntheses reports

Example for: Individual Services

Climate Changes for the Greater Cairo Region, Potential Impacts and Possibilities for Adaptation Options

Date: 8 April 2013

Author: Climate Service Center Germany – An Institution of the
Helmholtz Association

Hamburg, Germany

Outline

Objectives and overview

Synthesis on state-of-the-art in climate modeling

- Introduction to climate modeling
- A side note to regional climate modeling
- New developments in climate science

Climate of Greater Cairo Region and future climate changes

Synthesis on state-of-the-art on possible impacts of climate changes and vulnerability

- The concept of vulnerability and its application to informal areas
- Water availability in a changing climate

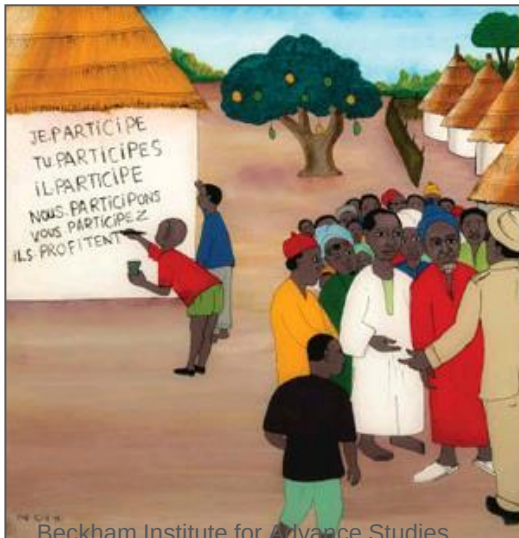
Conclusions and recommendations

Knowledge transfer and Capacity Building

Example for: Individual Services

Organization of „Capacity Development“ courses for countries of the South (Central America, South America, Africa, Asia)

- Technical courses on handling of climate data and climate information
- Participatory processes
 - **Prioritization** of adaptation actions
 - Use of **decision-support tools**
 - **Participation** approaches and models



Federal Ministry for the
Environment, Nature Conservation
and Nuclear Safety



Deutsche Gesellschaft
für Internationale
Zusammenarbeit (GIZ) GmbH

of the Federal Republic of Germany

Impression from a workshop held in Cameroon on
behalf of the GIZ

Lessons learned

After 5 years of CSC

- The concept of climate service is new and largely **unexplored**
 - Service needs **Science**.
 - The national and international landscapes are **complex** with different competing institutions at different levels.
 - The scientific community is not yet sufficiently **engaged**.
 - Until today, many customers **do not know** which services and products they need.
 - The functions of CSC include aspects that clearly belong to a **public service**, while others are primarily **market-oriented tasks**.
-

Thank You



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