ZEF

Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

Working Paper 142

Joachim von Braun and Matthias Kalkuhl

International Science and Policy Interaction for Improved Food and Nutrition Security:

Toward an International Panel on Food and Nutrition (IPFN)

ISSN 1864-6638 Bonn, October 2015

ZEF Working Paper Series, ISSN 1864-6638
Department of Political and Cultural Change
Center for Development Research, University of Bonn
Editors: Christian Borgemeister, Joachim von Braun, Manfred Denich, Solvay Gerke, Till Stellmacher and Eva Youkhana

Authors' addresses

Joachim von Braun
Center for Development Research (ZEF), University of Bonn,
Walter-Flex-Str. 3
53113 Bonn, Germany
Tel. 0049 (0)228-73 1800: Fax 0228-731972
E-mail: jvonbraun@uni-bonn.de
www.zef.de

Matthias Kalkuhl
Center for Development Research (ZEF), University of Bonn,
Walter-Flex-Str. 3
53113 Bonn, Germany
Tel. 0049 (0)228-73 1841: Fax 0228-731972
E-mail: mkalkuhl@uni-bonn.de
www.zef.de

International Science and Policy Interaction for Improved Food and Nutrition Security:

Toward an International Panel on Food and Nutrition (IPFN)

Joachim von Braun, Matthias Kalkuhl

1 Introduction

Establishing and maintaining the socio-economic, public health, environmental and political conditions for food and nutrition security is a high priority of societies and decision makers. As many people in the world are still deprived of sufficient access to nutritious food and healthy living conditions (see Table 1), the Sustainable Development Goals (SDGs) postulate for 2030 to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture" (Goal 2). Achieving this goal is not possible in isolation, as it is closely connected to progress in other domains mentioned among the SDGs, e.g. "Ensure healthy lives and promote well-being for all at all ages"(Goal 3), "Achieve gender equality and empower all women and girls"(Goal 5), "Ensure availability and sustainable management of water and sanitation for all"(Goal 6), "Ensure sustainable consumption and production patterns"(Goal 12), "Take urgent action to combat climate change and its impacts"(Goal 13), "Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss"(Goal 15), as well as the primary goal of "End poverty in all its forms everywhere" (Goal 1).

Achieving food and nutrition security will not only require strong commitment by policy makers but also solid scientific knowledge and transparent public discourse on instruments, synergies, trade-offs and risks. Even beyond 2030, the stability of the global food system will remain being exposed to environmental and health risks (IPCC 2014, ELD Initiative 2015), population pressure (Gerland et al. 2014), constraints in production, disruptions in trade or conflicts. Tackling that science agenda is not a project or a study, but calls for a permanent mechanism that draws systematically on the global science capacities in new ways currently not available.

Table 1. The Multiple World Food and Nutrition Problems

Problems	**Numbers of people**	**Consequences**
Hunger (Under-Nutrition, calories)	ca. 0,8 Bill. (crude estimate)	acute deficiency, political conflicts
Hidden Hunger (deficiencies of micro-nutrients, vitamines, iron etc).	ca. 2 Bill. (crude estimate)	diseases, reduced productivity
Children's under-nutrition (the first 1000 days)	ca. 165 Mill.	stunting, reduced physical, cognitive development.
Obesity and resulting chronic diseases	ca. 1 Bill.	high costs of public health

Source: derived from data presented in Black et al. (2013) and FAO (2013)

Scientific knowledge is a global public good, provided by a large diversity of individuals, local, national and global research institutions and financed at different scales by governments, donors, private enterprises or international organizations. An optimal provision of public goods requires coordination (Ostrom 1990), and needs to ask: How much knowledge should be provided? Who provides knowledge? What are research gaps and priorities? The current institutional arrangements for the policy and science interactions are not equipped to comprehensively address the huge task of guiding toward a world without hunger and malnutrition. An approach toward design such policy-science interaction, partly based on established building blocks of international organizations and science networks is proposed here. Some initiatives actually are already moving in this direction. To move the process forward more swiftly and less ad hoc needs high-level initiative. A Scientific Steering Committee established in the context of the EXPO 2015 on "The Role of Research in Global Food and Nutrition Security" has noted the limitations of current systems, as well as opportunities for innovations (some related sources, such as this one, are listed as references below).

The framework proposed here for improved policy and science interaction in food and nutrition security (FN) builds on the experience of the *Intergovernmental* Panel on Climate Change (IPCC), however, not simply copying this institutional arrangement, but merely aiming for an *International* Panel on Food and

Nutrition Security. It should operate efficiently at low administrative and organizational transactions costs. Such an institutional innovation to synthesize and assess knowledge relevant for decision makers would bring about four important advantages compared to the current system (Kowarsch 2014). It would

1. better reflect the **diversity and presence as well as lack of consensus** in international science insights and knowledge from different disciplines and countries, and may resolve key issues with new research,
2. improve **exchange and coordination** among science disciplines and research efforts at scale,
3. increase **transparency** in the synthesis and assessment process based on rigorous peer cooperation and peer review, and
4. increase the **legitimacy** of assessments and recommendations to governments and society.

These four advantages are particularly important for areas with high controversies either due to conflicting scientific findings or due to controversial ethical views in assessing and valuing different measures and options to achieve social goals like food and nutrition security (Edenhofer and Kowarsch 2015). Besides regular assessments on the state of food security *research* (on academic advances and deficits – not on description of developments), the strength of such an institutional arrangement would be to deal with controversial and conflict-laden assessments, for instance on nutrition interventions, market stabilization policies, technologies and innovations (potential, risks, regulation), land use change, land ownership (incl. land investments) or multi-level governance structures and responsibilities that often paralyze decision-making. Before outlining options for the way forward, the current state of affairs in science and policy related to FN, shall be briefly visited.

2 Science Systems addressing FN

Science systems related to FN are embedded in national science systems but with a large and increasing sets of international linkages, as well as some international entities. The main building blocks are

- The university systems with FN and public health related faculties
- National Academies and international Academy networks in general and with a focus on FN and health
- National food, nutrition, and agriculture related research organizations
- Private sector research (mainly in high income countries)
- The Consultative Group on International Agricultural Research Centers (CGIAR) with its programs
- the High Level Panel of Experts on Food Security and Nutrition (HLPE)
- The professional academic associations related to FN, broadly defined (incl. e.g. international Nutrition, Food Science, Crop science, Soil Science, Animal science, Agricultural Economics associations etc.)

All these entities serve important roles in moving the science frontiers in FN, and selectively engage with policy, be it on demand by policy bodies or be it by soliciting policy advice. However, they do not come together as organizations to address key policy challenges in FN across disciplines. An exception is the CGIAR in the field of FN related development issues, but the total science resources of the CGIAR cover not more than about 3 percent of total world science capacities in FN; another exception is the recently established Interacademy Partnership (IAP), a new organization of academies bringing together established global networks of academies of science, medicine and engineering into a collaboration in which academies work together to support the special role of science and its efforts to seek solutions to address the world's most challenging problems, incl. an initiative on FN started in 2015.

3 Policy System addressing FN

The policy system on FN represents the demand side for science based insight. FN policies are national, regional, and international, with many interactions and externalities among these levels. The SDGs emphasize national responsibilities for action. The roles and structures of the global organizations addressing food, nutrition / health, and agricultural issues have evolved over the past six decades. International civil society and governmental organizations also play increasing roles.

- national governments, mostly with multi-level structures
- civil society organizations
- G7 and G20 initiatives
- Organisation for Economic Co-operation and Development (OECD)
- World Health Organisation (WHO)
- Food and Agriculture Organization of the United Nations (FAO)
- World Food Programme (WFP)
- International Fund for Agricultural Development (IFAD)
- United Nations Children's Fund (UNICEF)
- United Nations Environment Program (UNEP)
- United Nations Framework Convention on Climate Change (UNFCCC)
- Convention on Biological Diversity (CBD), and its mechanisms
- United Nations Convention to Combat Desertification (UNCCD)

All these organizations serve important public goods functions, and all make important contributions. Furthermore, they all draw in one way or the other on specific science communities for advice, but the science advice is thereby segmented and coherence of evidence based science advice cannot be assured, and conflicting evidence is not resolved.

International public goods provisioning increasingly occurs also through a complex global web of government networks, where a collection of nation states communicate via heads of states, ministers, parliamentarians and the UN, and where corporations and NGOs participate in various ways. Networks of national governments and even province level governments and of cities, whose officials come together on a regular basis to exchange information, co-ordinate activities, and adopt policies to address common problems at a global scale. They already play key roles in international policy domains such as public health, crime prevention, and energy but not enough in areas of food, and nutrition. Furthermore, civil society organizations at national and international levels are engaged in the policy process and play important roles in shaping policies, such as consumer groups, environmental organizations, farmers' organizations, etc. They also play a role in shaping science policy agendas.

4 Drivers of change

The science- and the political systems related to FN are both confronted with drivers of change of context in FN, which calls for new and more goal oriented forms of interaction among the two:

1. Demographic transformations with population growth, urbanization, rural aging in many parts of the developing world establish new structures and science challenges.
2. Behavioral change related to food consumption and live styles, partly resulting in the obesity and related health consequences.
3. The transformative roles of food and nutrition sciences, and food systems with new value chains, an increased role of processed food, supermarkets, integrate the food system ever more with the larger international economy in terms of labor markets, energy markets, and services, i.e. finance, and commodity markets and foreign direct investment.
4. The environmental aspects of agriculture and the increased scarcities of natural resources, i.e. water systems, fertile soils, biodiversity; and the huge risks of climate change, all with science challenges of growing complexities.
5. The protracted food and nutrition insecurity in about 400 million small farm households, which form the world's largest group of the hungry and malnourished, requires social science attention in conjunction with other sciences.

Obviously, these drivers of FN change are interlinked. Recognizing that science has a significant role to play for international economic development is an important first step toward results oriented science policy for food and nutrition security. Investment in science systems is part of any successful development policy. The science community today must rise to the challenge to connect to the debate on human and sustainable development goals. Some initiatives have been taken recently, such as Sustainable Development Science Network (SDSN), Green Growth Knowledge Platform (GGKN), and the emerging international network on Bioeconomy. Moreover, in the past two decades, information and communications technologies (ICTs) reduced transactions costs and improved the networking intensity in the international science systems, including with emerging economies. This will also facilitate more virtual approaches toward an international Panel on food and nutrition security, rather than any excessive meeting intensive arrangement.

5 A science based assessment mechanism for food and nutrition security: three options

The current and future challenges of food and nutrition security require a strong mechanism for science based assessment as a permanent institutional arrangement. An international arrangement tasked with this could be partly inspired by the Intergovernmental Panel on Climate Change (IPCC). While its medium-term focus for the coming two decades should relate to the SDGs to end hunger by 2030, it must have a long-term perspective on food and nutrition related risks and challenges beyond 2030.

An international arrangement that facilitates the peer reviewed assessments on food and nutrition security is needed for delivering evidence based analyses for action with foresight. This function goes far beyond any of the existing science advisory bodies for policy at national or international levels. The whole international science system related to food and nutrition security and agriculture needs to be tapped into for the purpose.

As both, the science system and the policy systems of FN sketched above, are complex and multi-layered, any choice of options for design of mechanisms for improved international science – policy interaction need to carefully consider a set of criteria such as

1. Contribution to improve the informed decision making process on food and nutrition security effectively and efficiently, in comparison with business as usual,
2. Political and organizational feasibility of action for implementation on both sides and jointly, the science component and the political / organizational component of an International Panel type mechanism,
3. Costs of implementation and of management of mechanisms, including transaction costs for coordination and exchange (Williamson 1981)

Each of the three options considered below have their plusses and minuses in relation to each of these criteria. Table 2 summarizes the evaluation of the different options which differ in the degree of coordination within the science bodies and between the academic and political domain. While option 1 represents business-as-usual, implementation of option 3 would be based on design principles of the IPCC. Option 2 would imply less political linkages while option 3 requires embedding in the UN system. Below, the options are explained in more detail.

Option 1: Working with the current and emerging system

- Perspective: Reliance on established and evolving science – policy interactions with further marginal refinements (e.g. Dicks et al. 2014). Hope that global integration and enhanced science capacities in FN in middle income countries may facilitate some gradual improvement of science based actions that may improve international actions in FN.
- Limitations: Demand by FN policy for evidence based FN insights and science systems' supply of such insights may remain at a low level. International organizations and political bodies may continue to focus on defined subsets of FN agendas and synergies potentials and attention to trans-sectoral nexus issues between nutrition, health, sanitation, food and agriculture will hardly be captured. Lack of legitimacy for evaluating policy options that involve normative judgements.
- Potential contribution to enhance the achievement of the FN related SDG effectively and efficiently: limited potential;

- Political and organizational feasibility on both sides, the science component and the political / organizational component of an International Panel type mechanism: not only feasible but likely, as political costs of a no-action option are low in the short term.
- Costs, including transactions costs, of implementation and of management of mechanisms: no cost of implementation; continued high transactions costs of uncoordinated and duplicated science – policy interactions in multiple organizational settings.
- Implementation action: no action needed.

Table 2. Assessment of the different options for science-policy interaction

	Potential benefits	Transaction costs	Feasibility	Best suitable for
Option 1: Business as usual (Working with the current and emerging system)	Fast and ad-hoc small-scale assessments or reviews possible but limited potential for large-scale issues	No additional up-front costs; Redundancies and gaps due to lack of coordination remain	High (business-as-usual)	Problems of limited disciplinary or regional scope, involving little controversies
Option 2: Establishment of an *International* Panel on Food and Nutrition Security **(Science in the lead)**	Better coordination and academic dispute settling than option 1. Global mobilization of science for FN. New problem solving research is triggered.	Lower coordination costs than option 3 (governments and International Organizations are invited and comment on findings, but no veto possible)	High political feasibility. Participation of scientists due to ISI listed publications, strengthened networks among scientists.	Issues where decision-making depends on comprehensive science base but not necessarily on consensus
Option 3: Establishment of an *Inter-governmental* Panel on Food and Nutrition Security **(Governments and international organizations in conjunction with science bodies in the lead)**	Increased legitimacy and credibility for controversial issues due to mandate by international community. Clarity on peer review of existing research (no new research). Enforced coordination among science and policy.	High transaction costs (time spent by researchers) due to broad participation, transparency rules and formal approval by governments.	Requires strong leadership and commitment of international institutions and governments. Participation of scientists based on reputation and policy impact.	Problems where consensus is necessary for decision-making (UN system)

Option 2: Establishment of an International Panel on Food and Nutrition Security (Science in the lead)

- Perspective: Not following the IPCC approach and design. Establishment of a standing mechanism for science and policy related to FN to assess the state of scientific evidence on a set of well-defined FN policy challenges. Strong peer review based assessments. Policy bodies and civil society would be invited to comment on assessments that also reflect controversies (no need for consensus reports). Would bring FN science communities world-wide together with some focus. Evidence base around controversial FN issues would be openly stated, no principle to reach consensus needed, but identification for needed science on controversial issues.
- Limitations: Governments and international organizations would pick and choose as fit their circumstances and priorities. Civil society and media might engage more for identified opportunities and for avoidance of emerging risks related to progress in the SDG on end hunger. Assessments could become less policy-relevant if only conducted by scientists without strong and bi-directional exchange mechanism with policy makers (Briggs and Knight 2011, Roux et al. 2006)
- Potential contribution to enhance the achievement of the FN related SDG effectively and efficiently: some potential;
- Political and organizational feasibility on both sides, the science component and the political / organizational component of an International Panel type mechanism: feasible if proper incentive systems would be created for the global science communities related to FN to actually participate (reputation, funding). Political costs of the option are low. Private sector and NGOs might support the process if they *expect to influence* assessment
- Costs, including transactions costs, of implementation and of management of mechanisms: direct costs for meetings of the plenary, bureau, expert panels ($1.5-$2.0 mln.) and for secretariat ($2.1 mln)[1] plus indirect costs for working time of authors and reviewers plus additional implementation costs for specific objectives; reduced transactions costs due to less uncoordinated and duplicated science on specified themes.
- Implementation action: Starting the mechanism on the science side; political side is actively observing. Selected UN Agencies (possibly WHO and FAO) share observer roles and provide feedback to the science forum's assessments. National Governments are also serving as observers of the assessments and provide feedback.

Option 3: Establishment of an Intergovernmental Panel on Food and Nutrition Security (Governments and international organizations together with science bodies in the lead)

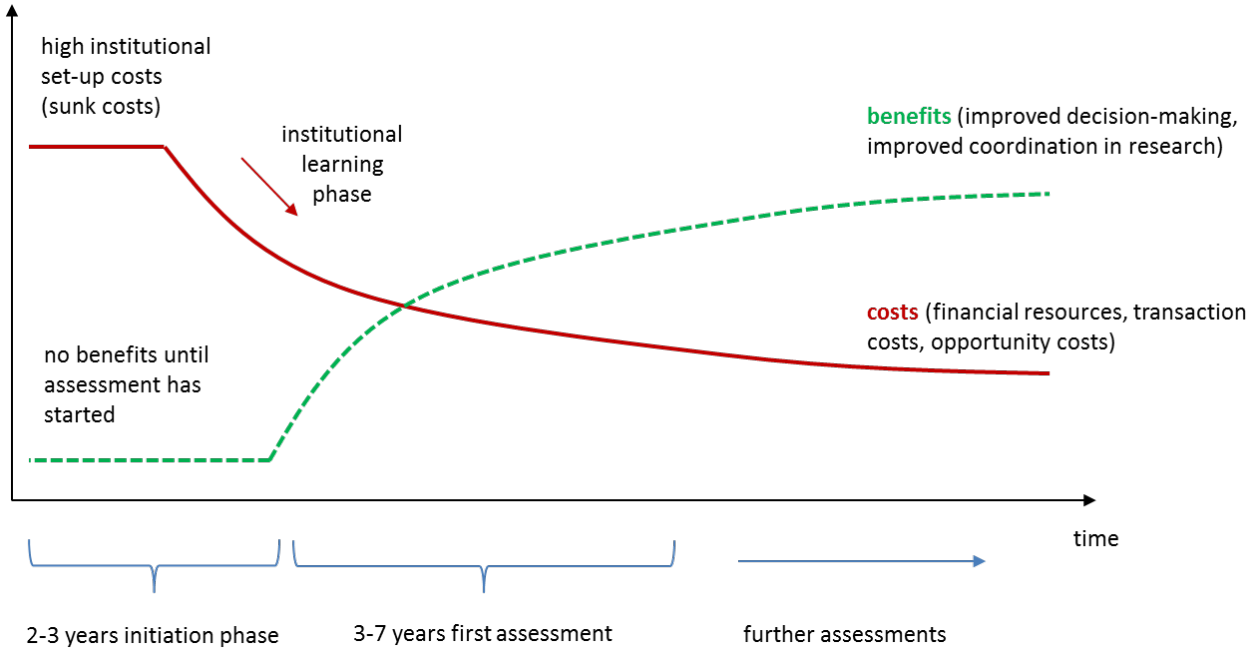
- Perspective: Basically following the IPCC design and approach. Establishment of a standing forum for science and policy related to FN to assess the state of scientific evidence on a set of well-defined FN policy challenges. Strong peer selection governs the peer-review based assessments. Formal interaction to conclude assessments with policy bodies. Would bring FN science and policy communities world-wide together with a clear focus on solutions for FN Security.

[1] Costs based on budget positions in the budget and expenditure arrangements of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES/3/10 http://ipbes.net/images/documents/plenary/third/working/3_10/IPBES_3_10_EN.pdf).

- Limitations: taking more time to establish such mechanism and assessment processes are also slower than on informal basis, even after governments and international organizations might agree on it. Because more policy driven in terms of themes, civil society and media would engage much more for identified opportunities and for avoidance of emerging risks related to progress in the SDG on end hunger and improved nutrition.
- Potential contribution to enhance the achievement of the FN related SDG effectively and efficiently: significant potential; also potential to overcome controversies that paralyze decision-making.
- Political and organizational feasibility on both sides, the science component and the political / organizational component of an International Panel type mechanism: political feasibility may be constrained by international organizations' turf interests. Political organizations such as G20 with EU could play a catalytic role for initiation (EU experience with JPIs on food security and on nutrition, etc.). Some private sector and NGOs might oppose the process because of formal rules based on scientific principles; other might support the process (depending on their *expectations on the outcome* of the assessments). Scientists willing to contribute if demanded by international community, academic quality is good and report has impact.
- Costs, including transactions costs, of implementation and of management of mechanisms: cost of similar to option 2 plus indirect costs of political coordination (full plenary UN-type meetings, additional coordination requirements within national governments & ministries); rigorous transparency and review rules increase time and burden researchers have to spend for contributing to assessments. Much reduced transactions costs due to less uncoordinated and duplicated science on specified themes.
- Implementation action: Starting the mechanism simultaneously on the science and political side. Selected UN Agencies (possibly WHO and FAO) share lead roles. Feedback to the science body's findings are encouraged beyond government by civil society. To enhance knowledge transfer, a first assessment report by IPFN could include climate-change related FNS topics with some former authors / co-chairs of IPCC reports to benefit from their experience.

Any such initiative as outlined for options 2 and 3 need to be assessed from both, a cost and benefits perspective. These options involve the establishment of a new institutional framework which is associated with set-up-costs and delayed benefits' streams. One has to prepare for initial run-up challenges in coordination that will be overcome through time due to institutional learning and improvement. The benefits of option 2 and 3 manifest themselves only after first assessments have been conducted. As illustrated in Figure 1, the benefits are long-term while the costs are significant in the short-term. The political commitment for option 2 or 3 should therefore explicitly take into account the delayed benefits while the major efforts occur in the short-run. Option 3 may increase the wedge between short-term costs and long-term benefits further due to formalized decision-making procedures in the UN context. Furthermore, the consent-oriented approval mechanism by policy makers in the IPCC (option 3) proved difficult for evaluating policies by scientists (Edenhofer and Minx 2014). The evaluation of (past) policies is, however, crucial to improve future policies.

Figure 1. Dynamic cost and benefit structure of an International Panel on Food and Nutrition



Source: Own illustration.

The institutional design for implementing a Panel on FN is inspired by the IPCC.

Table 3 illustrates the major design option of the proposed IPFN (options 2 and 3) compared to the existing IPCC.

Table 3. Institutional design options for assessment reports (with the IPCC as bench mark model)

Institutional principles / elements	IPFN (options 2 or 3)	IPCC
Organizational body		
Acronym	International or Intergovernmental Panel on Food and Nutrition (IPFN)	Intergovernmental Panel on Climate Change (IPCC)
Aim	Provide guidance for ending hunger and for promoting sustained food and nutrition security (SDG2 and beyond) • Measurement of hunger, food security, progress • Future scenarios of supply, demand, risks • Policy options at multiple scales (international/national/local; public-private)	Assess scientific knowledge in climate change with environmental and socio-economic impacts, inter alia: • Measurement of greenhouse gas emissions / concentration • Scenarios • Assessment of impacts, risks, uncertainties • Options for policy makers
Formal role in political decision making	Provide science based information to national, regional and international bodies on means to achieve SDG2 in the context of related goals.	Provide science bases for UNFCCC process and negotiations
Science-policy approach	Motto: "policy relevant but not prescriptive"; provide neutral and comprehensive science basis for decision makers IPFN does stimulate to conduct also new research to resolve or reduce controversies	Motto: "policy relevant but not prescriptive"; provide neutral and comprehensive science basis for decision makers IPCC does not conduct research – only assessment and harmonization
Institutional embedding	Option2: politically independent: Network of Academies of Sciences Option 3: FAO, WHO (Rome, Geneva)	World Meteorological Organization (WMO), Geneva
Membership	Option 2: science arrangements drive the system Option 3 Governments and FAO, WHO, WFP, IFAD, UNDP and UN countries	All WMO and UN countries can participate
Operational issues	Secretariat Rome, or Geneva, or Brussels	Secretariat at WMO coordinates meetings, issues documents etc.
Budget and funding	• Funding as part of OECD's commitments to ODA • Voluntary contributions from member countries • Trust Fund for supporting participation of developing countries' experts and publication and translation of reports • In-kind support by governments by hosting 'Technical Support Units' and	• Regular funding from WMO and UNEP (also some staff for secretariat hosted at WMO) • Voluntary contributions from member countries • IPCC Trust Fund for supporting participation of developing countries' experts and publication and translation of reports

	hosting meetings Authors and reviewers do not receive remuneration	• In-kind support by governments by hosting 'Technical Support Units' and hosting meetings Authors and reviewers do not receive remuneration
Decision making process	Option 2: Decisions (incl. approving reports) by science criteria Option 3: Decisions (incl. approving reports) shall be by consensus. Decision making by 'qualified majority' rule	Strong role of consensus principle. Procedural issues are to be decided according to general WMO regulations. Differences in views should be documented.
Assessment reports		
Participation in assessment (report writing)	**Authors** by invitation of Lead Authors, **Lead Authors** by selection of IPFN Bureau **Reviewers**: anybody qualified can become reviewer	**Authors** by invitation of Lead Authors, **Lead Authors** by selection of IPCC Bureau **Reviewers**: anybody can become reviewer
Internal structure for assessments	Institutional architecture to involve all relevant disciplines Formation of thematic work teams	Three working groups: (1) Physical Science Base, (2) Impacts & Adaptation, (3) Mitigation.
Assessment reports	**1: Assessment Reports:** Conduct regular reports every 5 years on the state of food security *research* (focus has to be on academic advances and deficits – not on description of developments) **2: Special reports** with narrow scope; possible topics: Future scenarios and risks Nutrition interventions (micronutrients) Drivers of obesity Technologies and Innovations (potential, risks, regulation) Land use and land ownership (incl. land investments) **3: Methodological reports**, e.g. on measuring FN (guidance for practitioners, governments, applied researchers) **4. Policy briefs** for political bodies (with a structured process for commenting by them)	**1. Assessment reports:** full scientific and technical assessment of climate change; report by each of the three working groups; summary for policy makers **2. Special reports:** (usually conducted by one working group), e.g. Technology Transfer (2000); Carbon Dioxide and Storage (2005); Renewable Energy (2011); Extreme Events (2012) **3. Methodological reports:** materials that provide practical guidelines for the preparation of greenhouse gas inventories, incl. uncertainty management
Personnel (management)	**IPFN Bureau consists of the Chair and vice-chairs** (steering committee) elected by IPFN plenary for operational decisions; advisory board elected by plenary as control institution	**IPCC Bureau consists of the Co-Chairs and Vice-Chairs**; elected by IPCC panel, by majority rule; nominee shall have appropriate scientific qualification
Process of report-	1. Scoping meeting to develop outline	1. Scoping meeting to develop

writing (drafts, review, approval)	of the report 2. Selection of authors 3. 1st order draft; then expert review 4. 2nd order draft and draft of SPM; expert *and* government review 5. Publication of report and SPM Option 2: Governments are invited to review and comment but no approval function; Option 3: acceptance / approval by IPFN Plenary	outline of the report 2. Bureau selects authors based on nominations 3. 1st order draft; then expert review 4. 2nd order draft and draft of SPM; expert *and* government review 5. Final draft of report and SPM; then government review 6. Acceptance / approval by IPCC Plenary
Review procedure	Review Editors have to ensure that all review comments are addressed by the authors. All comments are archived.	Review Editors have to ensure that all review comments are addressed by the authors. All comments are archived.
Summary for policy-makers (SPM)	Option 2: Is written by Co-Chairs in consultation with the Lead Authors of the Chapters. Option 3: Is written by Co-Chairs of the Working Group; Govt's approve SPM line-by-line (and can demand changes)	Is written by Co-Chairs of the Working Group; Govt's approve SPM line-by-line (and can demand changes)
Acceptance / Approval	Option 3 only: Acceptance [= report provides comprehensive, objective and balanced view] of the whole report by the IPFN Approval [=line-by-line agreement] of SPM	**Acceptance** [= report provides comprehensive, objective and balanced view] of the whole report by the IPCC **Approval** [=line-by-line agreement] of SPM
Conflict of interest policy	Same as IPCC	Rigid transparency guidelines following rules of the InterAcademy Council

Source: Own elaborations based on IPCC documentation (http://www.ipcc.ch/organization/organization_structure.shtml and http://www.ipcc.ch/organization/organization_procedures.shtml, last accessed 16 Sep 2015)

6 Conclusions: toward action

The food and nutrition security issues loom large and need action. Science needs to play a key role to offer global and context specific local solutions. If steps in the direction of improved science – policy interaction are not taken, incoherent and uncoordinated actions for food and nutrition security, often lacking scientific evidence base, will continue to hamper needed progress toward a world to "end hunger, achieve food security and improved nutrition and promote sustainable agriculture"(SDG 2).

The IPCC can serve as a useful role model and reference point, but its strong emphasis on consensus is owed to the global public good characteristic of the climate problem which requires strongly coordinated decision making within the UN system. Food and nutrition, though being a global issue, provides much more scope for local, national and sectoral decision making. The need for a comprehensive science base and an objective science-policy dialogue as well as improved coordination to close research gaps is at the moment more important than to achieve consensus in all areas. Considering the political and administrative (transactions) costs of the options 2 and 3, an Intergovernmental Panel on Food and Nutrition Security (option 3) is a long term scenario at best. Rather option 2 should be pursued to begin with, and option 3 might be considered in the longer term future.

Coming to a meaningful implementation of the option 2 will require science policy leadership. Leadership for change could come from the science community. Political and some financial support would be needed by the UN and the G20. EU is with its research infrastructure well placed to play the essential catalytic role to further develop the proposed initiative (Soussana et al. 2012). For a policy-relevant assessment, it will be crucial to establish stakes for the policy domain in assessment processes without compromising the scientific neutrality of the process.

To move the process forward toward option 2 initially may need a high-level, broad based, legitimized time-bound dialogue forum that embraces the whole set of FN challenges, and addresses the organizational implications.

Following political decisions based on a comprehensive implementation plan, the setup of the system could be done step by step, managed by a small task force supported by a secretariat.

7 Acknowledgment

This concept paper benefited from discussions with Ottmar Edenhofer, Co-Chair of the IPCC's Working Group on Mitigation, and Martin Kowarsch, head of the working group Scientific Assessments, Ethics, and Public Policy at the Mercator Research Institute on Global Commons and Climate Change, Berlin. The views expressed in this paper are of the authors.

8 References

Black, R. E., Victora, C. G., Walker, S. P., Bhutta, Z. A., Christian, P., De Onis, M., ... & Maternal and Child Nutrition Study Group. (2013). Maternal and child undernutrition and overweight in low-income and middle-income countries. *The Lancet*, *382*(9890), 427-451.

Briggs, S. V., & Knight, A. T. (2011). Science-policy interface: scientific input limited. *Science (New York, NY)*, *333*(6043), 696.

Committee on World Food Security, Reform of the Committee on World Food Security, Thirty-fifth Session, Rome, 14, 15 and 17 October 2009.

CGIAR Independent Review Panel (2008). Bringing Together the Best of Science and the Best of Development. Independent Review of the CGIAR System. Washington, DC.

Dicks, L. V., Hodge, I., Randall, N. P., Scharlemann, J. P., Siriwardena, G. M., Smith, H. G., Smith, R. K., & Sutherland, W. J. (2014). A transparent process for "Evidence-Informed" policy making. *Conservation Letters*, *7*(2), 119-125.

Edenhofer, O., & Kowarsch, M. (2015). Cartography of pathways: A new model for environmental policy assessments. *Environmental Science & Policy*, *51*, 56-64.

ELD Initiative. (2015). Report for policy and decision makers: Reaping economic and environmental benefits from sustainable land management. Available from www.eld-initiative.org.

Edenhofer, O., & Minx, J. (2014). Mapmakers and navigators, facts and values. *Science*, *345*(6192), 37-38.

EXPO 2015 Scientific Steering Committee. 2015. The Role of Research in Global Food and Nutrition Security. Discussion Paper. Brussels

FAO (2013). The state of food insecurity in the World 2013. The multiple dimensions of food security. FAO, Rome.

Gerland, P., Raftery, A. E., Ševčíková, H., Li, N., Gu, D., Spoorenberg, T., & Wilmoth, J. (2014). World population stabilization unlikely this century. *Science*, *346*(6206), 234-237.

IPCC (2014). Summary for policymakers. In: *Climate Change 2014: Impacts, Adaptation, and Vulnerability. Part A: Global and Sectoral Aspects. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 1-32.

Kowarsch, M. (2014). What are scientific assessments? *MCC Working Paper*, draft version 24 Nov 2014

Oosterveer, P. (2007). Global Governance of Food Production and Consumption: Issues and Challenges. Edward Elgar Publ. Cheltenham

Ostrom, E. (1990). Governing the Commons: The Evolution of Institutions for Collective Action. Cambridge University Press.

Roux, D. J., K. H. Rogers, H. C. Biggs, P. J. Ashton and A. Sergeant. (2006). Bridging the science–management divide: moving from unidirectional knowledge transfer to knowledge interfacing and sharing. *Ecology and Society* **11**(1): 4.

Slaughter, A.M. (2004). A New World Order. Princeton University Press.

Soussana, J.-F., E. Fereres, S.P. Long, F.G.M.J. Mohren, R. Pandya-Lorch, P. Peltonen-Sainio, J.R. Porter, T. Rosswall, and J. von Braun (2012). 'A European Science Plan to Sustainably Increase Food Security under Climate Change'. Global Change Biology, 18(11): 3269-71, November.

Williamson, O. (1981). 'The Economics of Organization – The Transactions Cost Approach'. American Journal of Sociology, 87(3): 548-77.

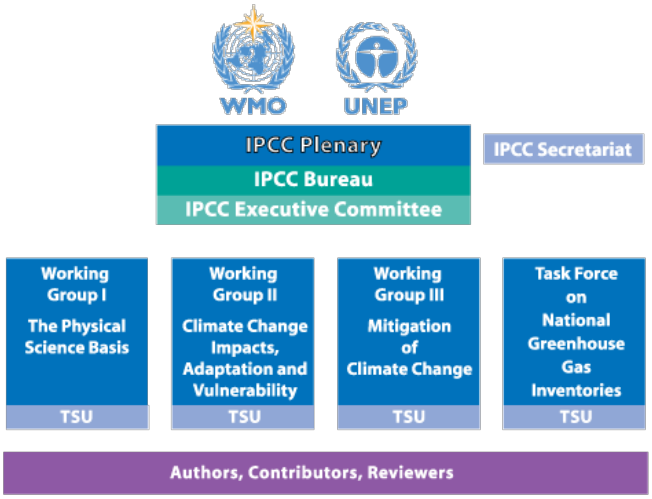
Annex 1: How the Intergovernmental Panel on Climate Change (IPCC) works:

- Scientists contribute on a voluntary basis
- The Panel takes major decisions at Plenary Sessions of government representatives.
- A central IPCC Secretariat supports the work of the IPCC.
- IPCC has 195 members
- Panel meets once per year
- Each IPC member has a focal point
    - Focal points prepare and update the list of national experts

- The IPCC is currently organized in **3 Working Groups and a Task Force**.
    - They are assisted by Technical Support Units (TSUs), which are hosted and financially supported by the government of the developed country Co-Chair of that Working Group/Task Force.
    - A TSU may also be established to support the IPCC Chair in preparing the Synthesis Report for an assessment report.

    - **Working Group I** deals with "The Physical Science Basis of Climate Change"
    - **Working Group II** with "Climate Change Impacts, Adaptation and Vulnerability"
    - **Working Group III** with "Mitigation of Climate Change".
    - Working Groups meet in plenary session at the level of government representatives.
    - The **main objective** of the Task Force on National Greenhouse Gas Inventories is to develop and refine a methodology for the calculation and reporting of national greenhouse gas emissions and removals.

- Besides the Working Groups and Task Force, further Task Groups and Steering Groups may be established for a limited or longer duration to consider a specific topic or question. One example is the Task Group on Data and Scenario Support for Impact and Climate Analysis (TGICA).
- **Decisions** during the plenary sessions include:
    - Election of IPCC Chair, IPCC Bureau, Task Force Bureau
    - Structure, mandate of the working groups and task force
    - IPCC principles and procedures
    - Work plan of the IPCC
    - Budget
    - Scope and outline of the IPCC reports
    - Approval, adoption and acceptance of reports



Based on: http://www.ipcc.ch/organization/organization_structure.shtml

Annex 2: The expected SDGs and the SDG2

The expected SDGs

Goal 1. End poverty in all its forms everywhere
Goal 2. End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3. Ensure healthy lives and promote well-being for all at all ages
Goal 4. Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5. Achieve gender equality and empower all women and girls
Goal 6. Ensure availability and sustainable management of water and sanitation for all
Goal 7. Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10. Reduce inequality within and among countries
Goal 11. Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12. Ensure sustainable consumption and production patterns
Goal 13. Take urgent action to combat climate change and its impacts*
Goal 14. Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16. Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels
Goal 17. Strengthen the means of implementation and revitalize the global partnership for sustainable development

Source: https://sustainabledevelopment.un.org/content/documents/4523zerodraft.pdf

Specifically the Goal to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture" entails a set of targets emphasizing access to nutritious and sufficient food, and end of all forms of malnutrition, as expressed by stunting and wasting of children, etc. (see Box on targets below).

Targets for the Goal 2 to "End hunger, achieve food security and improved nutrition and promote sustainable agriculture"

2.1 By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round
2.2 By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons
2.3 By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment
2.4 By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality
2.5 By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed
2.a Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries
2.b Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round
2.c Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility
The 2009 Declaration of the World Summit on Food Security defines the concept of food security as "Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilization and stability. The nutritional dimension is integral to the concept of food security" (FAO 2009, p.1). FAO further states, that based on this definition, "…four food security dimensions can be identified: food availability, economic and physical access to food, food utilization and stability (vulnerability and shocks) over time" FAO 2013, p. 17). Each food security dimension is described by specific indicators by FAO (2013).

Source: https://sustainabledevelopment.un.org/content/documents/4523zerodraft.pdf

ZEF Working Paper Series, ISSN 1864-6638
Department of Political and Cultural Change
Center for Development Research, University of Bonn
Editors: Christian Borgemeister, Joachim von Braun, Manfred Denich, Solvay Gerke, Eva Youkhana and Till Stellmacher

25. Obeng, G. Y.; Evers, H.-D.; Akuffo, F. O., Braimah, I. and A. Brew-Hammond (2007). Solar PV Rural Electrification and Energy-Poverty Assessment in Ghana: A Principal Component Analysis.
26. Eguavoen, Irit; E. Youkhana (2008). Small Towns Face Big Challenge. The Management of Piped Systems after the Water Sector Reform in Ghana.
27. Evers, Hans-Dieter (2008). Knowledge Hubs and Knowledge Clusters: Designing a Knowledge Architecture for Development
28. Ampomah, Ben Y.; Adjei, B. and E. Youkhana (2008). The Transboundary Water Resources Management Regime of the Volta Basin.
29. Saravanan.V.S.; McDonald, Geoffrey T. and Peter P. Mollinga (2008). Critical Review of Integrated Water Resources Management: Moving Beyond Polarised Discourse.
30. Laube, Wolfram; Awo, Martha and Benjamin Schraven (2008). Erratic Rains and Erratic Markets: Environmental change, economic globalisation and the expansion of shallow groundwater irrigation in West Africa.
31. Mollinga, Peter P. (2008). For a Political Sociology of Water Resources Management.
32. Hauck, Jennifer; Youkhana, Eva (2008). Histories of water and fisheries management in Northern Ghana.
33. Mollinga, Peter P. (2008). The Rational Organisation of Dissent. Boundary concepts, boundary objects and boundary settings in the interdisciplinary study of natural resources management.
34. Evers, Hans-Dieter; Gerke, Solvay (2009). Strategic Group Analysis.
35. Evers, Hans-Dieter; Benedikter, Simon (2009). Strategic Group Formation in the Mekong Delta - The Development of a Modern Hydraulic Society.
36. Obeng, George Yaw; Evers, Hans-Dieter (2009). Solar PV Rural Electrification and Energy-Poverty: A Review and Conceptual Framework With Reference to Ghana.
37. Scholtes, Fabian (2009). Analysing and explaining power in a capability perspective.
38. Eguavoen, Irit (2009). The Acquisition of Water Storage Facilities in the Abay River Basin, Ethiopia.
39. Hornidge, Anna-Katharina; Mehmood Ul Hassan; Mollinga, Peter P. (2009). 'Follow the Innovation' – A joint experimentation and learning approach to transdisciplinary innovation research.
40. Scholtes, Fabian (2009). How does moral knowledge matter in development practice, and how can it be researched?
41. Laube, Wolfram (2009). Creative Bureaucracy: Balancing power in irrigation administration in northern Ghana.
42. Laube, Wolfram (2009). Changing the Course of History? Implementing water reforms in Ghana and South Africa.
43. Scholtes, Fabian (2009). Status quo and prospects of smallholders in the Brazilian sugarcane and ethanol sector: Lessons for development and poverty reduction.
44. Evers, Hans-Dieter; Genschick, Sven; Schraven, Benjamin (2009). Constructing Epistemic Landscapes: Methods of GIS-Based Mapping.
45. Saravanan V.S. (2009). Integration of Policies in Framing Water Management Problem: Analysing Policy Processes using a Bayesian Network.
46. Saravanan V.S. (2009). Dancing to the Tune of Democracy: Agents Negotiating Power to Decentralise Water Management.
47. Huu, Pham Cong; Rhlers, Eckart; Saravanan, V. Subramanian (2009). Dyke System Planing: Theory and Practice in Can Tho City, Vietnam.
48. Evers, Hans-Dieter; Bauer, Tatjana (2009). Emerging Epistemic Landscapes: Knowledge Clusters in Ho Chi Minh City and the Mekong Delta.
49. Reis, Nadine; Mollinga, Peter P. (2009). Microcredit for Rural Water Supply and Sanitation in the Mekong Delta. Policy implementation between the needs for clean water and 'beautiful latrines'.

50. Gerke, Solvay; Ehlert, Judith (2009). Local Knowledge as Strategic Resource: Fishery in the Seasonal Floodplains of the Mekong Delta, Vietnam

51. Schraven, Benjamin; Eguavoen, Irit; Manske, Günther (2009). Doctoral degrees for capacity development: Results from a survey among African BiGS-DR alumni.

52. Nguyen, Loan (2010). Legal Framework of the Water Sector in Vietnam.

53. Nguyen, Loan (2010). Problems of Law Enforcement in Vietnam. The Case of Wastewater Management in Can Tho City.

54. Oberkircher, Lisa et al. (2010). Rethinking Water Management in Khorezm, Uzbekistan. Concepts and Recommendations.

55. Waibel, Gabi (2010). State Management in Transition: Understanding Water Resources Management in Vietnam.

56. Saravanan V.S.; Mollinga, Peter P. (2010). Water Pollution and Human Health. Transdisciplinary Research on Risk Governance in a Complex Society.

57. Vormoor, Klaus (2010). Water Engineering, Agricultural Development and Socio-Economic Trends in the Mekong Delta, Vietnam.

58. Hornidge, Anna-Katharina; Kurfürst, Sandra (2010). Envisioning the Future, Conceptualising Public Space. Hanoi and Singapore Negotiating Spaces for Negotiation.

59. Mollinga, Peter P. (2010). Transdisciplinary Method for Water Pollution and Human Health Research.

60. Youkhana, Eva (2010). Gender and the development of handicraft production in rural Yucatán/Mexico.

61. Naz, Farhat; Saravanan V. Subramanian (2010). Water Management across Space and Time in India.

62. Evers, Hans-Dieter; Nordin, Ramli, Nienkemoer, Pamela (2010). Knowledge Cluster Formation in Peninsular Malaysia: The Emergence of an Epistemic Landscape.

63. Mehmood Ul Hassan; Hornidge, Anna-Katharina (2010). 'Follow the Innovation' – The second year of a joint experimentation and learning approach to transdisciplinary research in Uzbekistan.

64. Mollinga, Peter P. (2010). Boundary concepts for interdisciplinary analysis of irrigation water management in South Asia.

65. Noelle-Karimi, Christine (2006). Village Institutions in the Perception of National and International Actors in Afghanistan. (**Amu Darya Project Working Paper No. 1**)

66. Kuzmits, Bernd (2006). Cross-bordering Water Management in Central Asia. (**Amu Darya Project Working Paper No. 2**)

67. Schetter, Conrad; Glassner, Rainer; Karokhail, Masood (2006). Understanding Local Violence. Security Arrangements in Kandahar, Kunduz and Paktia. (**Amu Darya Project Working Paper No. 3**)

68. Shah, Usman (2007). Livelihoods in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (**Amu Darya Project Working Paper No. 4**)

69. ter Steege, Bernie (2007). Infrastructure and Water Distribution in the Asqalan and Sufi-Qarayateem Canal Irrigation Systems in the Kunduz River Basin. (**Amu Darya Project Working Paper No. 5**)

70. Mielke, Katja (2007). On The Concept of 'Village' in Northeastern Afghanistan. Explorations from Kunduz Province. (**Amu Darya Project Working Paper No. 6**)

71. Mielke, Katja; Glassner, Rainer; Schetter, Conrad; Yarash, Nasratullah (2007). Local Governance in Warsaj and Farkhar Districts. (**Amu Darya Project Working Paper No. 7**)

72. Meininghaus, Esther (2007). Legal Pluralism in Afghanistan. (**Amu Darya Project Working Paper No. 8**)

73. Yarash, Nasratullah; Smith, Paul; Mielke, Katja (2010). The fuel economy of mountain villages in Ishkamish and Burka (Northeast Afghanistan). Rural subsistence and urban marketing patterns. (**Amu Darya Project Working Paper No. 9**)

74. Oberkircher, Lisa (2011). 'Stay – We Will Serve You Plov!'. Puzzles and pitfalls of water research in rural Uzbekistan.

75. Shtaltovna, Anastasiya; Hornidge, Anna-Katharina; Mollinga, Peter P. (2011). The Reinvention of Agricultural Service Organisations in Uzbekistan – a Machine-Tractor Park in the Khorezm Region.

76. Stellmacher, Till; Grote, Ulrike (2011). Forest Coffee Certification in Ethiopia: Economic Boon or Ecological Bane?

77. Gatzweiler, Franz W.; Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Marginality. Addressing the roots causes of extreme poverty.

78. Mielke, Katja; Schetter, Conrad; Wilde, Andreas (2011). Dimensions of Social Order: Empirical Fact, Analytical Framework and Boundary Concept.

79. Yarash, Nasratullah; Mielke, Katja (2011). The Social Order of the Bazaar: Socio-economic embedding of Retail and Trade in Kunduz and Imam Sahib

80. Baumüller, Heike; Ladenburger, Christine; von Braun, Joachim (2011). Innovative business approaches for the reduction of extreme poverty and marginality?

81. Ziai, Aram (2011). Some reflections on the concept of 'development'.

82. Saravanan V.S., Mollinga, Peter P. (2011). The Environment and Human Health - An Agenda for Research.

83. Eguavoen, Irit; Tesfai, Weyni (2011). Rebuilding livelihoods after dam-induced relocation in Koga, Blue Nile basin, Ethiopia.

84. Eguavoen, I., Sisay Demeku Derib et al. (2011). Digging, damming or diverting? Small-scale irrigation in the Blue Nile basin, Ethiopia.

85. Genschick, Sven (2011). Pangasius at risk - Governance in farming and processing, and the role of different capital.

86. Quy-Hanh Nguyen, Hans-Dieter Evers (2011). Farmers as knowledge brokers: Analysing three cases from Vietnam's Mekong Delta.

87. Poos, Wolf Henrik (2011). The local governance of social security in rural Surkhondarya, Uzbekistan. Post-Soviet community, state and social order.

88. Graw, Valerie; Ladenburger, Christine (2012). Mapping Marginality Hotspots. Geographical Targeting for Poverty Reduction.

89. Gerke, Solvay; Evers, Hans-Dieter (2012). Looking East, looking West: Penang as a Knowledge Hub.

90. Turaeva, Rano (2012). Innovation policies in Uzbekistan: Path taken by ZEFa project on innovations in the sphere of agriculture.

91. Gleisberg-Gerber, Katrin (2012). Livelihoods and land management in the Ioba Province in south-western Burkina Faso.

92. Hiemenz, Ulrich (2012). The Politics of the Fight Against Food Price Volatility – Where do we stand and where are we heading?

93. Baumüller, Heike (2012). Facilitating agricultural technology adoption among the poor: The role of service delivery through mobile phones.

94. Akpabio, Emmanuel M.; Saravanan V.S. (2012). Water Supply and Sanitation Practices in Nigeria: Applying Local Ecological Knowledge to Understand Complexity.

95. Evers, Hans-Dieter; Nordin, Ramli (2012). The Symbolic Universe of Cyberjaya, Malaysia.

96. Akpabio, Emmanuel M. (2012). Water Supply and Sanitation Services Sector in Nigeria: The Policy Trend and Practice Constraints.

97. Boboyorov, Hafiz (2012). Masters and Networks of Knowledge Production and Transfer in the Cotton Sector of Southern Tajikistan.

98. Van Assche, Kristof; Hornidge, Anna-Katharina (2012). Knowledge in rural transitions - formal and informal underpinnings of land governance in Khorezm.

99. Eguavoen, Irit (2012). Blessing and destruction. Climate change and trajectories of blame in Northern Ghana.

100. Callo-Concha, Daniel; Gaiser, Thomas and Ewert, Frank (2012). Farming and cropping systems in the West African Sudanian Savanna. WASCAL research area: Northern Ghana, Southwest Burkina Faso and Northern Benin.

101. Sow, Papa (2012). Uncertainties and conflicting environmental adaptation strategies in the region of the Pink Lake, Senegal.

102. Tan, Siwei (2012). Reconsidering the Vietnamese development vision of "industrialisation and modernisation by 2020".

103. Ziai, Aram (2012). Postcolonial perspectives on 'development'.

104. Kelboro, Girma; Stellmacher, Till (2012). Contesting the National Park theorem? Governance and land use in Nech Sar National Park, Ethiopia.

105. Kotsila, Panagiota (2012). "Health is gold": Institutional structures and the realities of health access in the Mekong Delta, Vietnam.

106. Mandler, Andreas (2013). Knowledge and Governance Arrangements in Agricultural Production: Negotiating Access to Arable Land in Zarafshan Valley, Tajikistan.

107. Tsegai, Daniel; McBain, Florence; Tischbein, Bernhard (2013). Water, sanitation and hygiene: the missing link with agriculture.

108. Pangaribowo, Evita Hanie; Gerber, Nicolas; Torero, Maximo (2013). Food and Nutrition Security Indicators: A Review.

109. von Braun, Joachim; Gerber, Nicolas; Mirzabaev, Alisher; Nkonya Ephraim (2013). The Economics of Land Degradation.

110. Stellmacher, Till (2013). Local forest governance in Ethiopia: Between legal pluralism and livelihood realities.

111. Evers, Hans-Dieter; Purwaningrum, Farah (2013). Japanese Automobile Conglomerates in Indonesia: Knowledge Transfer within an Industrial Cluster in the Jakarta Metropolitan Area.

112. Waibel, Gabi; Benedikter, Simon (2013). The formation water user groups in a nexus of central directives and local administration in the Mekong Delta, Vietnam.

113. Ayaribilla Akudugu, Jonas; Laube, Wolfram (2013). Implementing Local Economic Development in Ghana: Multiple Actors and Rationalities.

114. Malek, Mohammad Abdul; Hossain, Md. Amzad; Saha, Ratnajit; Gatzweiler, Franz W. (2013). Mapping marginality hotspots and agricultural potentials in Bangladesh.

115. Siriwardane, Rapti; Winands, Sarah (2013). Between hope and hype: Traditional knowledge(s) held by marginal communities.

116. Nguyen, Thi Phuong Loan (2013). The Legal Framework of Vietnam's Water Sector: Update 2013.

117. Shtaltovna, Anastasiya (2013). Knowledge gaps and rural development in Tajikistan. Agricultural advisory services as a panacea?

118. Van Assche, Kristof; Hornidge, Anna-Katharina; Shtaltovna, Anastasiya; Boboyorov, Hafiz (2013). Epistemic cultures, knowledge cultures and the transition of agricultural expertise. Rural development in Tajikistan, Uzbekistan and Georgia.

119. Schädler, Manuel; Gatzweiler, Franz W. (2013). Institutional Environments for Enabling Agricultural Technology Innovations: The role of Land Rights in Ethiopia, Ghana, India and Bangladesh.

120. Eguavoen, Irit; Schulz, Karsten; de Wit, Sara; Weisser, Florian; Müller-Mahn, Detlef (2013). Political dimensions of climate change adaptation. Conceptual reflections and African examples.

121. Feuer, Hart Nadav; Hornidge, Anna-Katharina; Schetter, Conrad (2013). Rebuilding Knowledge. Opportunities and risks for higher education in post-conflict regions.

122. Dörendahl, Esther I. (2013). Boundary work and water resources. Towards improved management and research practice?

123. Baumüller, Heike (2013). Mobile Technology Trends and their Potential for Agricultural Development

124. Saravanan, V.S. (2013). “Blame it on the community, immunize the state and the international agencies.” An assessment of water supply and sanitation programs in India.

125. Ariff, Syamimi; Evers, Hans-Dieter; Ndah, Anthony Banyouko; Purwaningrum, Farah (2014). Governing Knowledge for Development: Knowledge Clusters in Brunei Darussalam and Malaysia.

126. Bao, Chao; Jia, Lili (2014). Residential fresh water demand in China. A panel data analysis.

127. Siriwardane, Rapti (2014). War, Migration and Modernity: The Micro-politics of the Hijab in Northeastern Sri Lanka.

128. Kirui, Oliver Kiptoo; Mirzabaev, Alisher (2014). Economics of Land Degradation in Eastern Africa.

129. Evers, Hans-Dieter (2014). Governing Maritime Space: The South China Sea as a Mediterranean Cultural Area.

130. Saravanan, V. S.; Mavalankar, D.; Kulkarni, S.; Nussbaum, S.; Weigelt, M. (2014). Metabolized-water breeding diseases in urban India: Socio-spatiality of water problems and health burden in Ahmedabad.

131. Zulfiqar, Ali; Mujeri, Mustafa K.; Badrun Nessa, Ahmed (2014). Extreme Poverty and Marginality in Bangladesh: Review of Extreme Poverty Focused Innovative Programmes.

132. Schwachula, Anna; Vila Seoane, Maximiliano; Hornidge, Anna-Katharina (2014). Science, technology and innovation in the context of development. An overview of concepts and corresponding policies recommended by international organizations.

133. Callo-Concha, Daniel (2014). Approaches to managing disturbance and change: Resilience, vulnerability and adaptability.

134. Mc Bain, Florence (2014). Health insurance and health environment: India’s subsidized health insurance in a context of limited water and sanitation services.

135. Mirzabaev, Alisher; Guta, Dawit; Goedecke, Jann; Gaur, Varun; Börner, Jan; Virchow, Detlef; Denich, Manfred; von Braun, Joachim (2014). Bioenergy, Food Security and Poverty Reduction: Mitigating tradeoffs and promoting synergies along the Water-Energy-Food Security Nexus.

136. Iskandar, Deden Dinar; Gatzweiler, Franz (2014). An optimization model for technology adoption of marginalized smallholders: Theoretical support for matching technological and institutional innovations.

137. Bühler, Dorothee; Grote, Ulrike; Hartje, Rebecca; Ker, Bopha; Lam, Do Truong; Nguyen, Loc Duc; Nguyen, Trung Thanh; Tong, Kimsun (2015). Rural Livelihood Strategies in Cambodia: Evidence from a household survey in Stung Treng.

138. Amankwah, Kwadwo; Shtaltovna, Anastasiya; Kelboro, Girma; Hornidge, Anna-Katharina (2015). A Critical Review of the Follow-the-Innovation Approach: Stakeholder collaboration and agricultural innovation development.

139. Wiesmann, Doris; Biesalski, Hans Konrad; von Grebmer, Klaus; Bernstein, Jill (2015). Methodological review and revision of the Global Hunger Index.

140. Eguavoen, Irit; Wahren, Julia (2015). Climate change adaptation in Burkina Faso: aid dependency and obstacles to political participation. Adaptation au changement climatique au Burkina Faso: la dépendance à l'aide et les obstacles à la participation politique.

141. Youkhana, Eva (2015). The power of things in transnational religious spaces - The example of the Virgin of Cisne in Madrid.

142. Von Braun, Joachim; Kalkuhl, Matthias (2015). International Science and Policy Interaction for Improved Food and Nutrition Security: toward an International Panel on Food and Nutrition (IPFN).

ZEF Development Studies

edited by
Solvay Gerke and Hans-Dieter Evers

Center for Development Research (ZEF), University of Bonn

Shahjahan H. Bhuiyan
Benefits of Social Capital. Urban Solid Waste Management in Bangladesh
Vol. 1, 2005, 288 p., 19.90 EUR, br. ISBN 3-8258-8382-5

Veronika Fuest
Demand-oriented Community Water Supply in Ghana. Policies, Practices and Outcomes
Vol. 2, 2006, 160 p., 19.90 EUR, br. ISBN 3-8258-9669-2

Anna-Katharina Hornidge
Knowledge Society. Vision and Social Construction of Reality in Germany and Singapore
Vol. 3, 2007, 200 p., 19.90 EUR, br. ISBN 978-3-8258-0701-6

Wolfram Laube
Changing Natural Resource Regimes in Northern Ghana. Actors, Structures and Institutions
Vol. 4, 2007, 392 p., 34.90 EUR, br. ISBN 978-3-8258-0641-5

Lirong Liu
Wirtschaftliche Freiheit und Wachstum. Eine international vergleichende Studie
Vol. 5, 2007, 200 p., 19.90 EUR, br. ISBN 978-3-8258-0701-6

Phuc Xuan To
Forest Property in the Vietnamese Uplands. An Ethnography of Forest Relations in Three Dao Villages
Vol. 6, 2007, 296 p., 29.90 EUR, br. ISBN 978-3-8258-0773-3

Caleb R.L. Wall, Peter P. Mollinga (Eds.)
Fieldwork in Difficult Environments. Methodology as Boundary Work in Development Research
Vol. 7, 2008, 192 p., 19.90 EUR, br. ISBN 978-3-8258-1383-3

Solvay Gerke, Hans-Dieter Evers, Anna-K. Hornidge (Eds.)
The Straits of Malacca. Knowledge and Diversity
Vol. 8, 2008, 240 p., 29.90 EUR, br. ISBN 978-3-8258-1383-3

Caleb Wall
Argorods of Western Uzbekistan. Knowledge Control and Agriculture in Khorezm
Vol. 9, 2008, 384 p., 29.90 EUR, br. ISBN 978-3-8258-1426-7

Irit Eguavoen
The Political Ecology of Household Water in Northern Ghana
Vol. 10, 2008, 328 p., 34.90 EUR, br. ISBN 978-3-8258-1613-1

Charlotte van der Schaaf
Institutional Change and Irrigation Management in Burkina Faso. Flowing Structures and Concrete Struggles
Vol. 11, 2009, 344 p., 34.90 EUR, br. ISBN 978-3-8258-1624-7

Nayeem Sultana
The Bangladeshi Diaspora in Peninsular Malaysia. Organizational Structure, Survival Strategies and Networks
Vol. 12, 2009, 368 p., 34.90 EUR, br. ISBN 978-3-8258-1629-2

Peter P. Mollinga, Anjali Bhat, Saravanan V.S. (Eds.)
When Policy Meets Reality. Political Dynamics and the Practice of Integration in Water Resources Management Reform
Vol. 13, 2010, 216 p., 29.90 EUR, br., ISBN 978-3-643-10672-8
Irit Eguavoen, Wolfram Laube (Eds.)
Negotiating Local Governance. Natural Resources Management at the Interface of Communities and the State
Vol. 14, 2010, 248 p., 29.90 EUR, br., ISBN 978-3-643-10673-5

William Tsuma
Gold Mining in Ghana. Actors, Alliances and Power
Vol. 15, 2010, 256 p., 29.90 EUR, br., ISBN 978-3-643-10811-1

Thim Ly
Planning the Lower Mekong Basin: Social Intervention in the Se San River
Vol. 16, 2010, 240 p., 29.90 EUR, br., ISBN 978-3-643-10834-0

Tatjana Bauer
The Challenge of Knowledge Sharing - Practices of the Vietnamese Science Community in Ho Chi Minh City and the Mekong Delta
Vol. 17, 2011, 304 p., 29.90 EUR, br., ISBN 978-3-643-90121-7

Pham Cong Huu
Floods and Farmers - Politics, Economics and Environmental Impacts of Dyke Construction in the Mekong Delta / Vietnam
Vol. 18, 2012, 200 p., 29.90 EUR, br., ISBN 978-3-643-90167-5

Judith Ehlert
Beautiful Floods - Environmental Knowledge and Agrarian Change in the Mekong Delta, Vietnam
Vol. 19, 2012, 256 S., 29,90 EUR, br, ISBN 978-3-643-90195-8

Nadine Reis
Tracing and Making the State - Policy practices and domestic water supply in the Mekong Delta, Vietnam
Vol. 20, 2012, 272 S., 29.90 EUR, br., ISBN 978-3-643-90196-5

Martha A. Awo
Marketing and Market Queens - A study of tomato farmers in the Upper East region of Ghana
Vol. 21, 2012, 192 S., 29.90 EUR, br., ISBN 978-3-643-90234-4

Asghar Tahmasebi
Pastoral Vulnerability to Socio-political and Climate Stresses - The Shahsevan of North Iran
Vol. 22, 2013, 192 S., 29.90 EUR, br., ISBN 978-3-643-90357-0

Anastasiya Shtaltovna
Servicing Transformation - Agricultural Service Organisations and Agrarian Change in Post-Soviet Uzbekistan
Vol. 23, 2013, 216 S., 29.90 EUR, br., ISBN 978-3-643-90358-7

Hafiz Boboyorov
Collective Identities and Patronage Networks in Southern Tajikistan
Vol. 24, 2013, 304 S., 34.90 EUR, br., ISBN 978-3-643-90382-2

Simon Benedikter
The Vietnamese Hydrocracy and the Mekong Delta. Water Resources Development from State Socialism to Bureaucratic Capitalism
Vol. 25, 2014, 330 S., 39.90 EUR, br., ISBN 978-3-643-90437-9

Sven Genschick
Aqua-`culture´. Socio-cultural peculiarities, practical senses, and missing sustainability in Pangasius aquaculture in the Mekong Delta, Vietnam.
Vol. 26, 2014, 262 S., 29.90 EUR, br., ISBN 978-3-643-90485-0

Farah Purwaningrum
Knowledge Governance in an Industrial Cluster. The Collaboration between Academia-Industry-Government in Indonesia.
Vol. 27, 2014, 296 S., 39.90 EUR, br., ISBN 978-3-643-90508-6

Panagiota Kotsila
Socio-political and Cultural Determinants of Diarrheal Disease in the Mekong Delta. From Discourse to Incidence
Vol. 28, 2014, 376 S., 39.90 EUR, br., ISBN 978-3-643-90562-8

Zentrum für Entwicklungsforschung
Center for Development Research
University of Bonn

Working Paper Series

Author: Joachim von Braun and Matthias Kalkuhl

Contact: jvonbraun@uni-bonn.de

Photo: ZEF

Published by:
Zentrum für Entwicklungsforschung (ZEF)
Center for Development Research
Walter-Flex-Straße 3
D – 53113 Bonn
Germany

Phone: +49-228-73-1861
Fax: +49-228-73-1869
E-Mail: zef@uni-bonn.de

www.zef.de