

The Diffusion of Innovations for the Sustainability Transition

HEINRICH BÖLL STIFTUNG
ECOLOGY

Jürgen Scheffran
Institute of Geography, KlimaCampus,
University of Hamburg

Working Paper for presentation
at ISA Annual Convention, San Francisco
3-6 April 2013; Workshop and Panel on
“Sustainability Transition”

North South Transitions to Green Economies

Making Export Support, Technology Transfer, and Foreign
Direct Investments Work for Climate Protection

By Tilman Santarius, Jürgen Scheffran, and Antonio Tricarico

Edited by the Heinrich Böll Foundation 2012

Heinrich Böll Foundation
The Green Political Foundation

Schumannstraße 9 10117 Berlin, Germany
Phone +49(0)30.285 34-0 Fax +49(0)30.285 34-109 www.boell.de

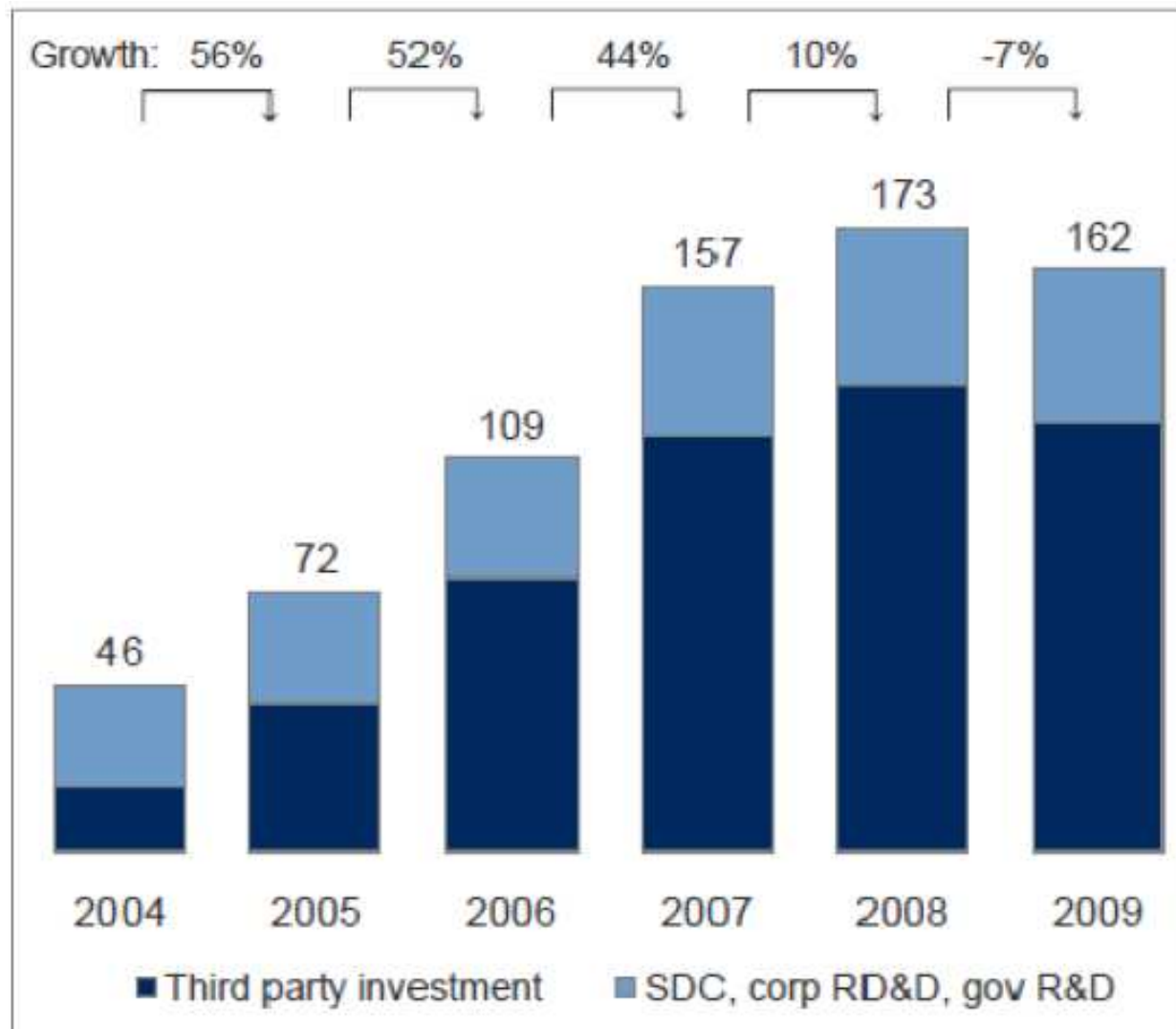
Towards a Green New Deal for a Sustainable Energy Transformation

- The innovation challenge for environment and development
- The shifting international context of climate finance and technology transfer
- Public policy and private investment: Mobilizing a virtuous cycle
- Clarifying benefits and incentives

Global trends in sustainable energy investment

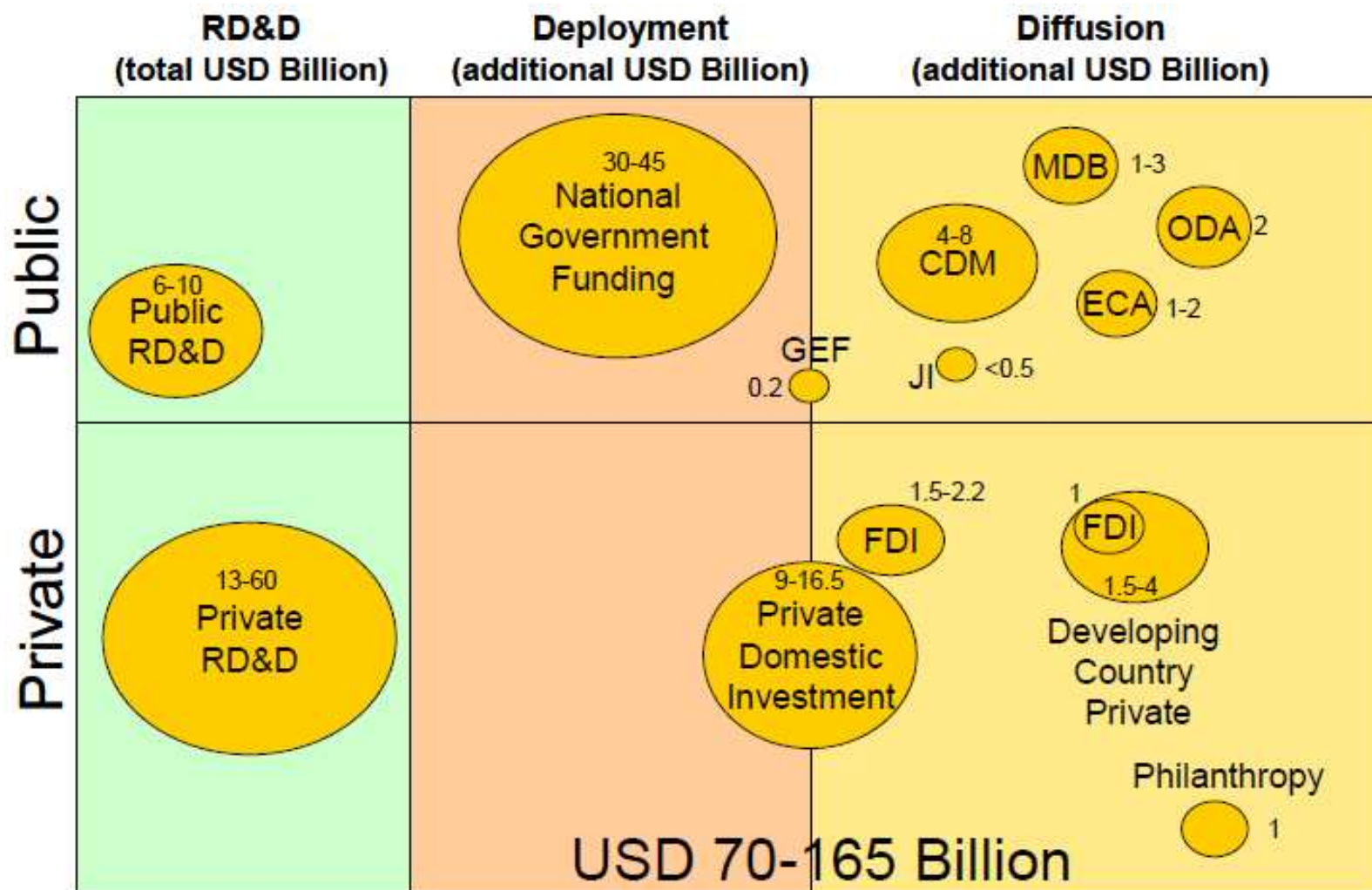
- Sustainable energy investment
- Trends in low-carbon foreign investment
- Future investment needs and prospects

Global investment in sustainable energy from 2004 to 2009 (bn \$)



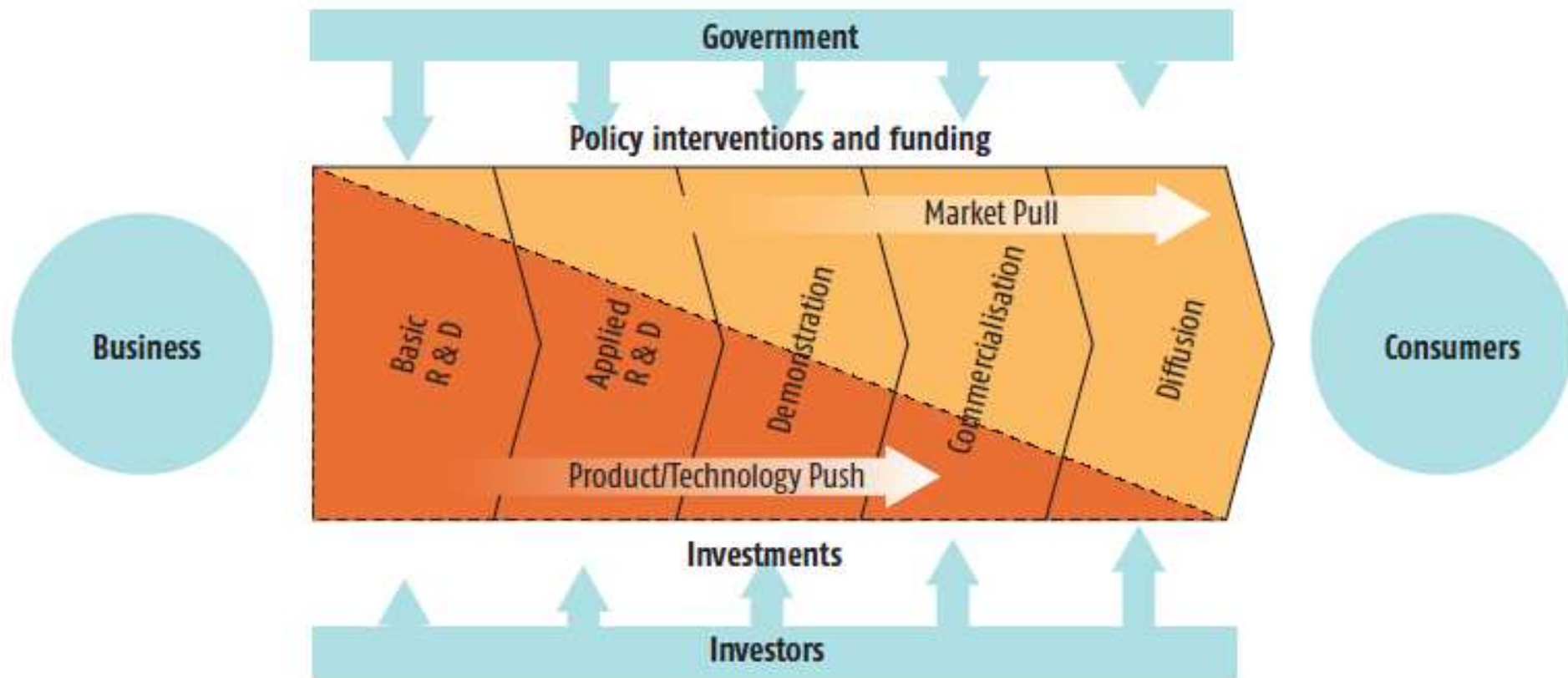
Source: Bloomberg (2010)

Estimates of current financing for mitigation technologies



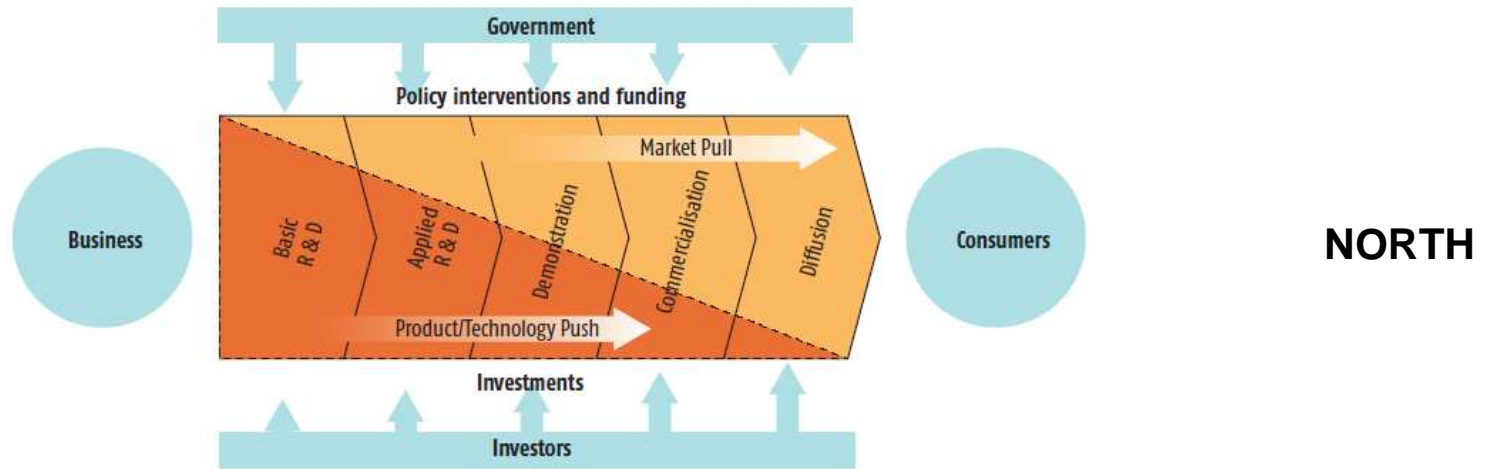
Abbreviations: CDM = clean development mechanism, ECA = export credit agency, FDI = foreign direct investment, GEF = Global Environment Facility, Jl = joint implementation, MDB = multilateral development bank, ODA = official development assistance, RD&D= research, development and deployment. (Source: UNFCCC 2009) 5

Innovation Chain

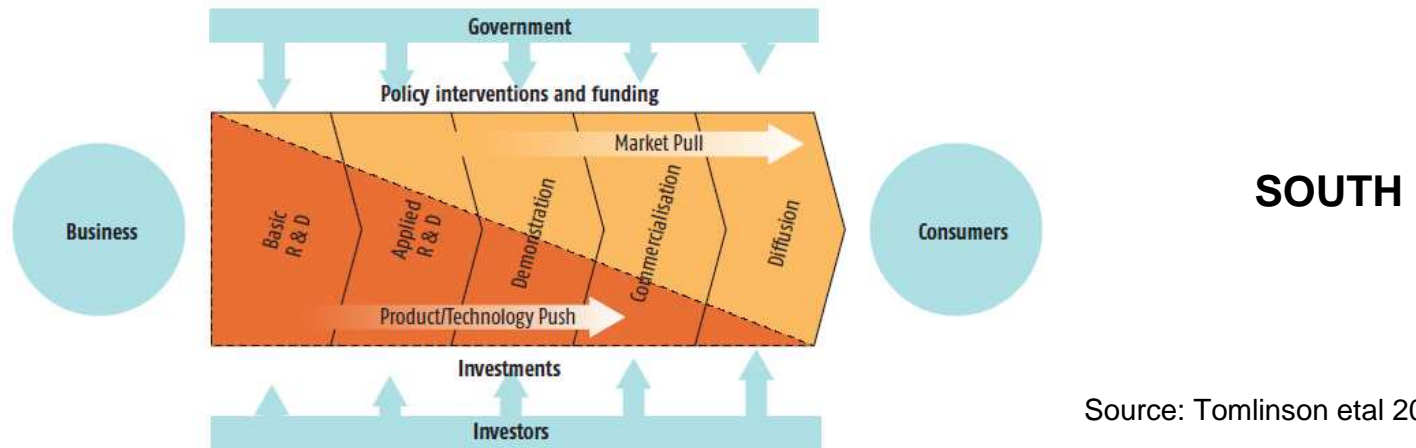


Source: Adapted from Grubb, 2004

Role of knowledge and technology transfer in the innovation chain



Source: Adapted from Grubb, 2004.

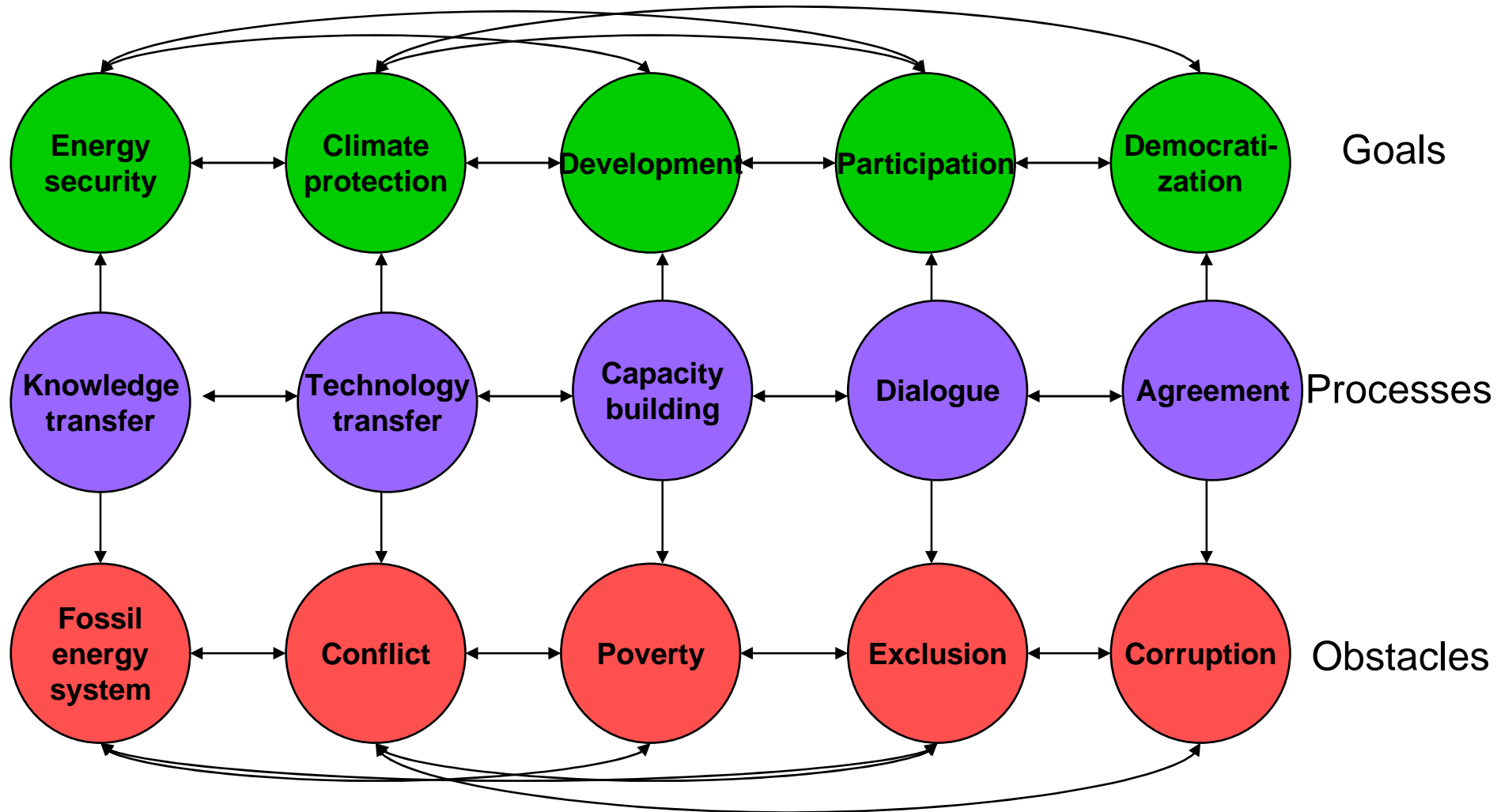


Source: Tomlinson et al 2008

Barriers and obstacles to technology transfer and investment

1. Lack of capacity building and domestic infrastructure
2. Macro-economic conditions and market failure
3. Lack of access to and sharing of data, information and knowledge
4. Lock-in due to lack of innovation and diffusion
5. Failure of R&D spending policy for low carbon innovation
6. Tensions and competition undermine international collaboration potentials
7. Intellectual property rights (IPR)
8. Financial and political obstacles for foreign investment

Goals, obstacles, processes



Possible criteria for sustainable development design

Environmental criteria

- Climate change
- Air quality
- Water supply and quality
- Land resources
- Biodiversity and wildlife protection

Economic criteria

- Microeconomic efficiency
- Macro-economic benefits
- Technology transfer
- Regional economy
- Employment generation

Political criteria

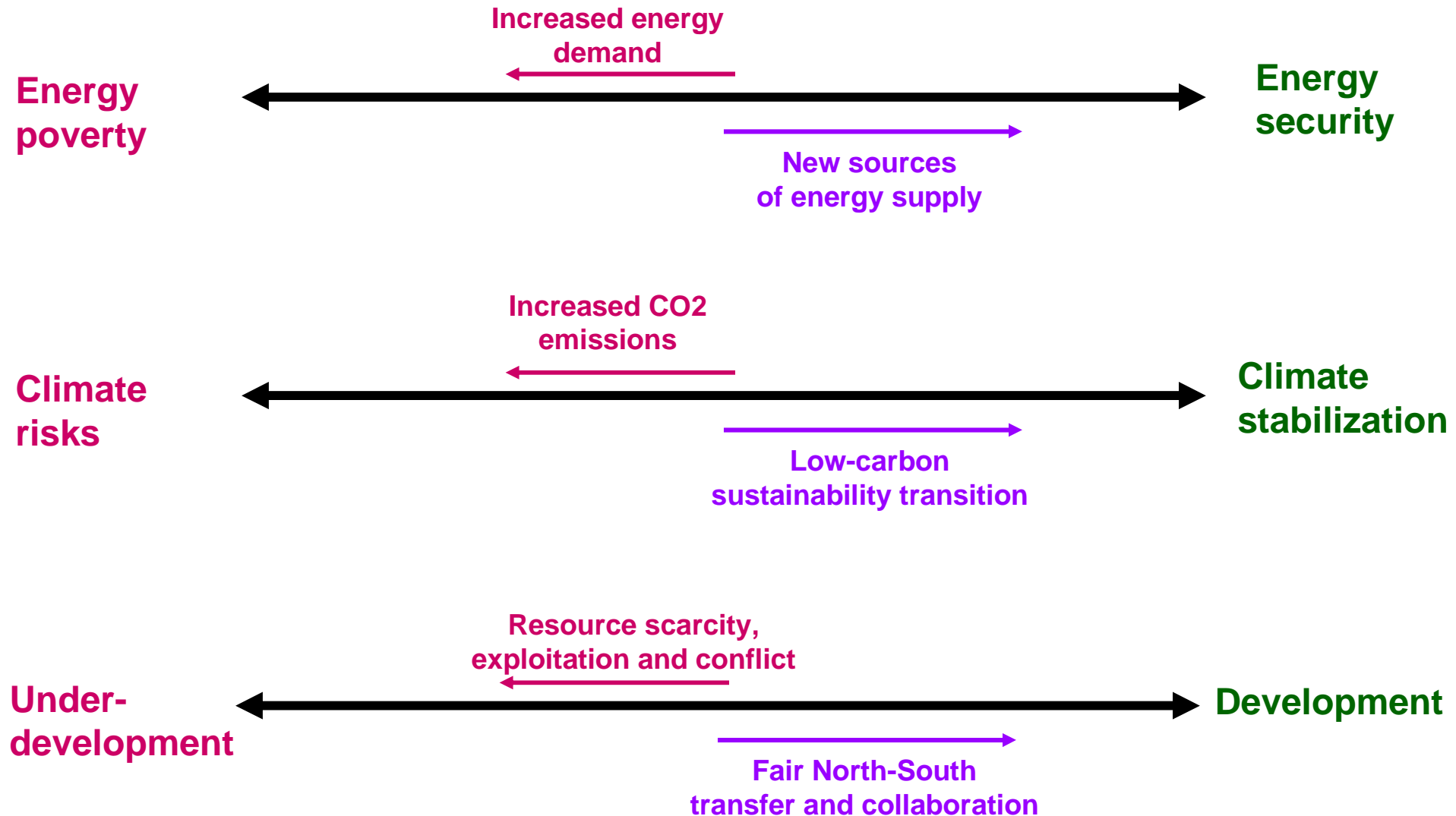
- Development for MENA
- No resource exploitation
- True cooperation
- Low conflict potential
- Political stability
- Democratization

Social criteria

- Risk avoidance
- Anti-corruption
- Stakeholder participation
- Improved service availability
- Capacity development
- Fair distribution of project return

Major goals

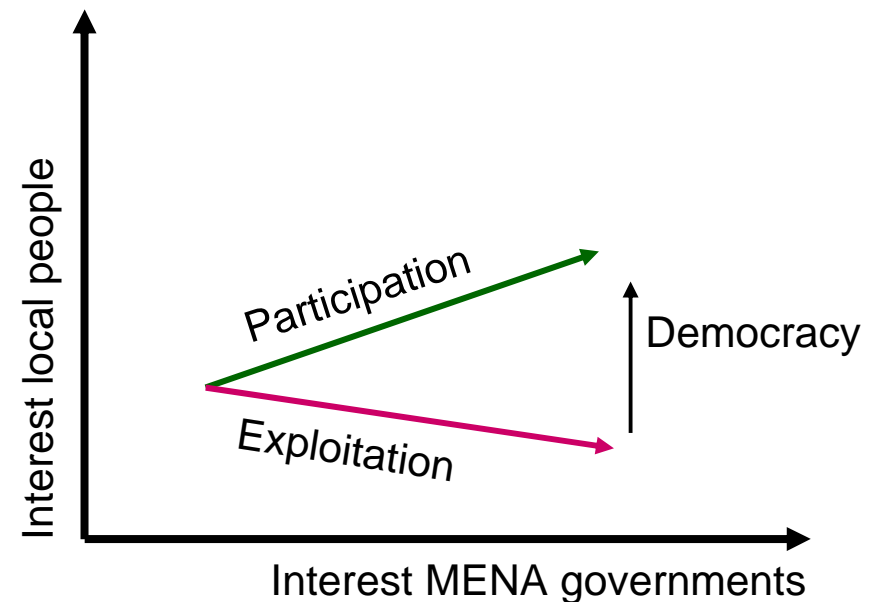
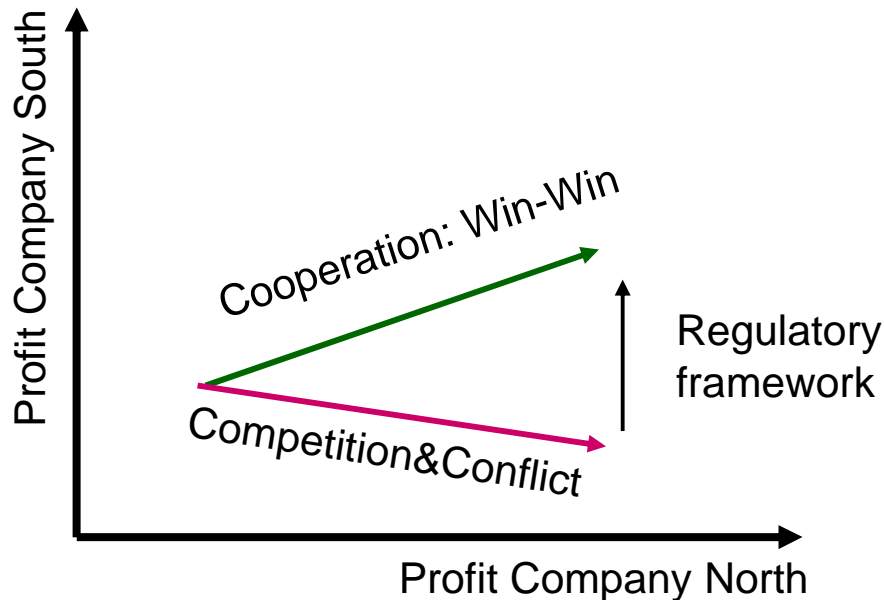
Vision: contribute to solution of energy, climate and development problem



Tradeoffs and conflicts between criteria

Some criteria may not be achieved at the same time and thus be in conflict

→ Consider transformation mechanisms to overcome conflict



Policies for Technology Transfer and an Enabling Infrastructure of Innovation

- Assessment of information, needs and technologies
- Establishing a science and technology infrastructure
- Building human, social and absorptive capacities
- Creating a legal and regulatory framework
- Strengthening economic conditions and incentives
- Incentivizing emerging low-carbon business opportunities

Building human, social and absorptive capacities

Developing countries need **capacity building** programmes and enabling environments that reduce the risks and restrictions associated with low-carbon technology transfer and increase the flow of technologies close to the commercial margin.

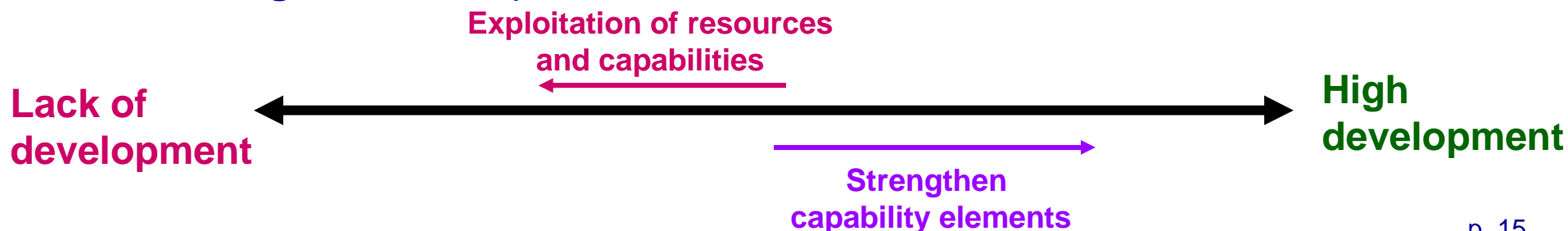
→ Enhance **scientific and technical skills**, capabilities, and institutions in developing countries for assessing, adapting, managing, and developing technologies.

→ **Education and training** is important to develop human capital for business, municipalities and government. Training of employees, engineers, operators and users builds local competency in the use of the technology.

Human development and capacity-building

From neo-liberal development to **capability approach** (Sen): improve human life-options and freedoms (capabilities) and actual achievements (functionings)

- Enlarge **people's choices**, e.g. long and healthy life, education, decent standard of living, political freedom, human rights and selfrespect
- **Sustainable human development**: integrity and intergenerational preservation of natural environment; human well-being, empowerment, opportunities and participation; equitable and fair distribution of resource use benefits.
- **Capacity**: “ability of individuals, institutions and societies to perform functions, solve problems, and set and achieve objectives in a sustainable manner” (UNDP 2006).
- **Capacity development** (UNDP 2008): enabling environment (institutional or societal level); organisational level; individual level
- **Capacity elements**: domestic markets, local supply chains, technology transfer and knowledge transfer, domestic interest, development goals and domestic stakeholder involvement (Platau-Wagner 2011).
- **Human right** for development



Elements for encouraging business to enhance investments and low-carbon technology diffusion

1. Strong **signals from governments** towards low-carbon growth, nationally and internationally, either through **targets or regulatory measures**.
2. Adequate **institutional and regulatory frameworks** to support technology development and / or deployment that provide stable policies, transparent investment regulation and conducive local conditions.
3. Appropriate **absorptive capacity** in institutions, business and society including a functioning education system, a receptive environment and targeted capacity building programs.
4. **Economic and financial incentives** to bridge the gap between low-carbon solutions and their commercial viability, such as funding, financing, fiscal or tax measures and the absence of perverse subsidies or trade barriers.
5. **Strengthening of drivers and removal of barriers** to energy efficiency, such as perverse subsidies, introducing economic incentives and consumer outreach.
6. Business engagement with governments would allow business expertise and know-how to be incorporated into the design of new instruments that aim to enhance **technology diffusion** to developing countries.

Policies for low-carbon technology transfer and investment governance

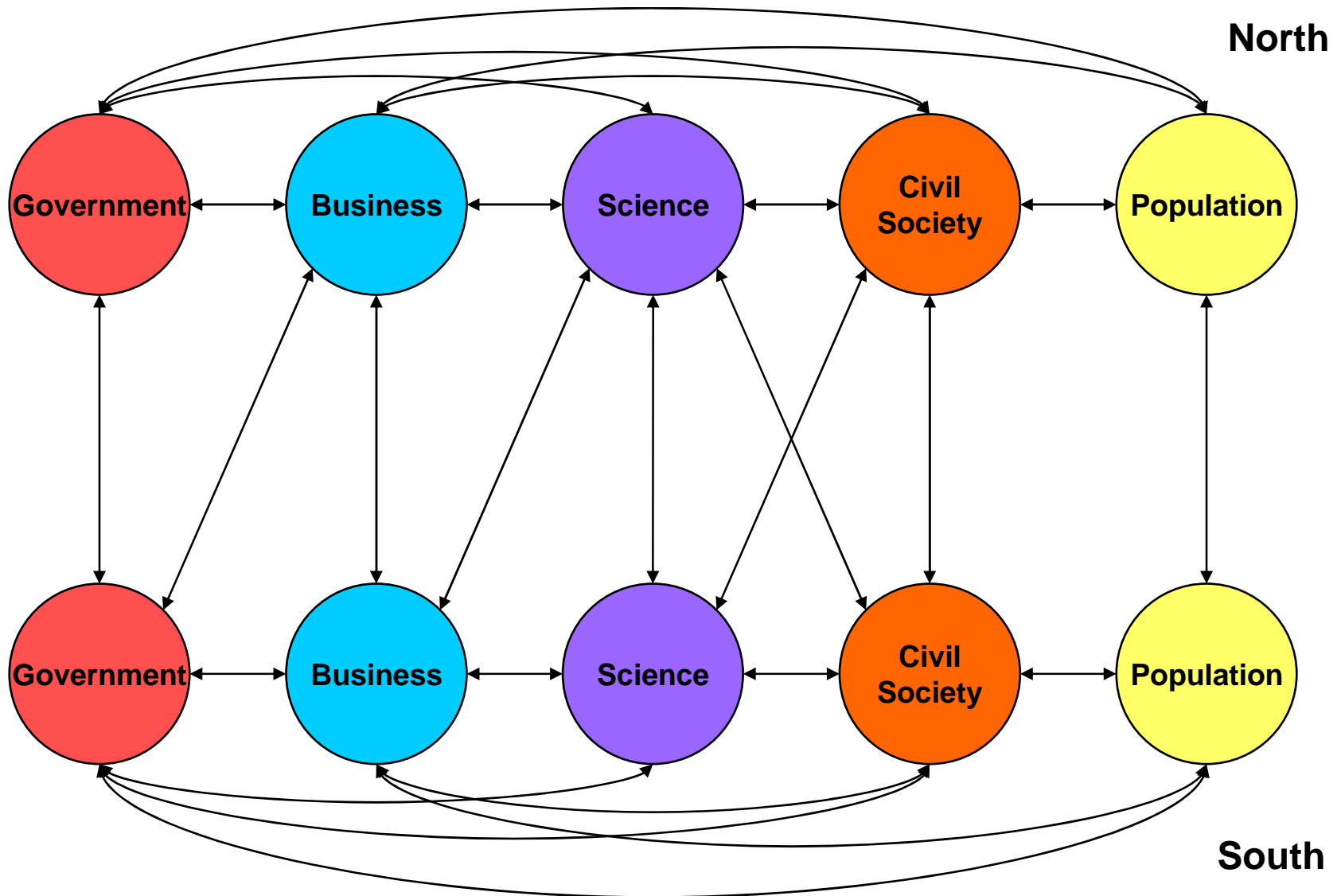
- Technology needs assessment and **technology roadmaps**
- **National systems of innovation** to develop absorptive capacity and an enabling environment for sustainable technology transfers
- **Build targeted capacities** and infrastructures, strengthen information access, awareness, education and training for public and private stakeholders involved in technology projects
- Promote **prototypes, demonstration projects**, extension services and technology dissemination through linkages between manufacturers, producers and end users
- **Macroeconomic and market conditions** to attract domestic and foreign investment
- Strengthen **economic diversification** and job creation
- **Incentivize new products** and business opportunities through financial incentives (e.g. FiT)
- Initiatives for **collaborative research**, development, demonstration & deployment (RDD&D)
- Facilities, networks, joint ventures and **partnerships** across public and private sectors
- Foreign investors to support **domestic capabilities** and markets
- **Legal structures** to encourage technology transfer and investment (including IPRs)
- **Political stability** and involve key stakeholders and social networks, including civil society
- International environment for green investment and technology transfer, within the framework of a Green New Deal

Social, organisational and institutional capacity

From top-down to **bottom-up** approaches:

- Create **social networks and infrastructures**
- Encouragement of **industry associations**, professional associations and user/consumer organisations
- **Participatory approaches** to enable private actors, public agencies, NGO's and grassroots organisations to engage at all levels of environmental policy-making and project formulation
- **Opportunities to develop firms** for management consulting, accounting, energy service, law, investment and product rating, trade, publishing and provision of communication, access to and transfer of information
- **Decentralisation of governmental decision-making** and authority, in relation to technology transfer, to meet community needs.
- **Roundtable process** can initiate a national dialogue of organised stakeholders representing various private as well as public interests.

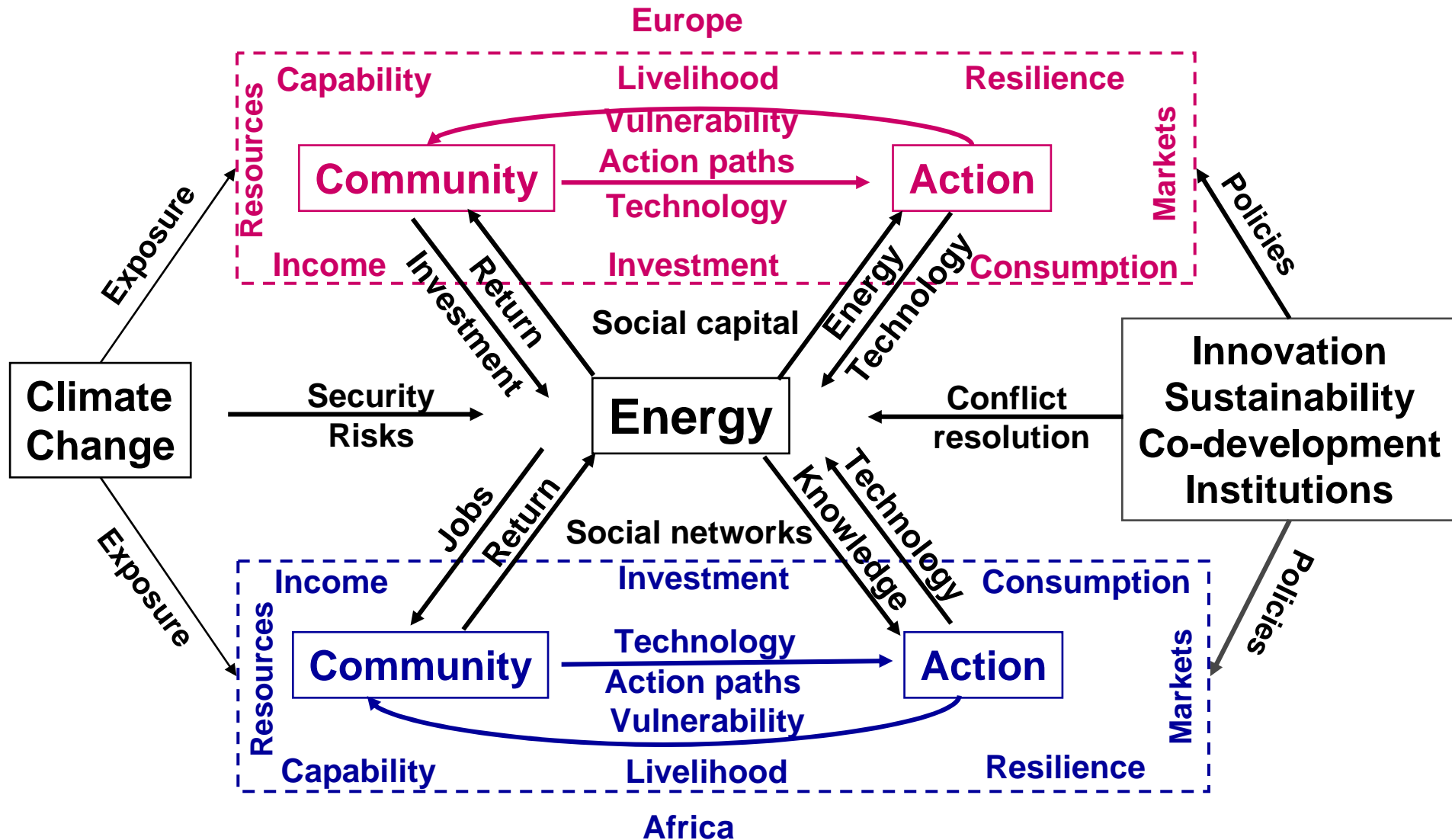
Network formation processes



Fields of EU-MENA Interaction

EU	Government	Population	Business	Science & Technology	NGO
MENA					
Government	Official Development Assistance, Energy, Water, Climate change, Security, Migration Law, Terrorism		Investment framework	Education	
Population	Democratization, Migration, Co-development, Human rights	Communication, Migration, Remittances	Jobs, Consumption, Trade		Democratization
Business	Investment framework	Consumption, Trade	Investment, Technology transfer, Energy	Technology transfer, Innovation	
Science & Technology	Education				
NGO	Human rights	Democratization, Social Networks, Communication			Communication, Social Networks

Energy as a field for inter-regional copoperation



Possible benefits for target countries

- creation of jobs that are necessary to build components for power plants and to operate power plants;
- know-how, technology and investment that is transferred (from Europe) or acquired to build and operate power plants;
- build-up of production capacities and necessary infrastructure;
- supply of renewable electricity to the (urban and rural) population of the target countries;
- enhancement of the electricity grid in the MENA region;
- desalination of water, based on renewable energy sources; and
- overall economic growth in the target countries.

Summary of actions and incentives for the public and private sectors in North and South

	Public sector	Private sector
North (Investing country)	<ul style="list-style-type: none"> • Reduce the role of current export credit agencies. • Build new institutional mechanisms that promote foreign investments to make them work for climate protection and sustainable development that will. • Raise public money to support and leverage climate-friendly foreign investments so as to insure investments against financial and market instabilities, incentivise investments into markets with limited demand, and thus make investments attractive, even where returns on investments are expected to be low. 	<ul style="list-style-type: none"> • Support should be offered to companies, e.g. renewable energy companies that aim to invest in countries with low production capacities. • The level of support should significantly raise companies' interests to go abroad. • Only those investments should be supported that conform to the highest standards at home. • Both public and private money raised may be used by countries to fulfil their international climate finance obligations
South (Recipient country)	<ul style="list-style-type: none"> • Implement strong, stable, transparent, coherent, credible, and ambitious long-term enabling environments. • Develop domestic technology roadmaps that identify countries' nationally appropriate mitigation actions. • Establish investment policies to effectively govern foreign investment inflows. • Design these policies in a way to maximise foreign investments' mitigation potentials as well as economic diversification and sustainable development. 	<ul style="list-style-type: none"> • Setting the stage for sustained economic growth as "green growth" and "energy autonomy" through domestic renewable energies have more long-term prospects than "fossil growth". • Provide opportunities for economic diversification by catalysing foreign capital to climate-friendly sectors. • Foster ownership and competitive strength of domestic/local companies in the global market by demanding foreign investors engage in joint ventures and purchase local goods. <p>Source: Santarius/Scheffran/Tricario 2012</p>

Outlook

- Further studies on technical and economic feasibility
- Comprehensive environmental impact analysis
- Assessment of social, cultural and political dimension
- Development of performance standards, evaluation criteria and indicators for certification (technical, economic, environmental, social, political)
- Roundtable and stakeholder dialogues
- Implementation involving stakeholders and civil society

Questions

- Factors and conditions for success?
- Overcome obstacles and criticism?
- Do technical structures create social structures?
- Collective action with commercial competition and national sovereignty?
- Who decides? Who pays?
- Who has benefits and disadvantages?
- Will the population in the MENA region benefit and participate?
- How to design negotiations and agreements?
- Are there potential differences and conflicts?
- How to resolve conflict and comply with cooperation?

Principles, criteria, indicators and values

- 1. Principles:** general conditions and concepts for achieving the final goal of sustainability (environmental, economic, social).
- 2. Criteria:** “[...] essentially indicate how the sustainability principles can be achieved”.
- 3. Indicators:** “[...] function by simplifying complex phenomena and information into quantifiable measures that can be readily communicated”; can also measure changes of criteria over a certain time period, can be used to determine compliance; balance between complexity and usability; aggregated indicators?
- 4. Reference values:** desired level of sustainability for each indicator. *absolute reference values* (max-min acceptable thresholds), *target values* (desirable states), *relative reference values* (compare values between different sectors, regional averages or different points in time).

Klawitter (2010) after Van Cauwenbergh et al. (2007)

Main principles

- Technically feasible and efficient
- Financially affordable
- Economically viable
- Environmentall sustainable
- Politically acceptable
- Strengthen human capability and development
- Socially beneficial
- Fair and equitable
- Building peace and security

Guidelines for Sustainability in the Energy Sector in Europe

- (1) Equal access** to energy resources and energy services.
- (2) Conservation of** different energy resources for future generations or create comparable options for sufficient energy services.
- (3) Compatibility with environment, climate and health:** preserve adaptability and ability for regeneration of natural systems. Risks for human health shall be avoided.
- (4) Social compatibility:** All people affected participate in decision-making processes. Scope of economic players and communities in acting and designing may not be restricted.

Guidelines for Sustainability in the Energy Sector in Europe

(5) Low risk and high error tolerance: Minimize unavoidable risks and hazards from energy, including human errors, improper handling, wilful damage and incorrect use.

(6) Comprehensive economic efficiency: make energy services available at acceptable costs, including external ecological and social costs.

(7) Meet the need of energy supply at any time: satisfying demand calls for efficient, flexible and diversified energy supply to react to crises and have room for expansion.

(8) International cooperation: Develop energy systems to eliminate conflict potentials from shortage of resources and promote peaceful co-existence of states

Potential obstacles and risks

- Lack of finance
- Water usage
- Allocation of electricity between electricity producing and receiving country
- Technical and political instability
- Resource exploitation
- Energy dependence
- Commercial competition
- International conflict and insecurity
- Neglect of participation or access rights
- Lack of knowledge and technology transfer
- Corruption, crime, terrorism
- Lack of monitoring, compliance and enforcement

Sustainable Desert Community

Home Base for Inhabitant's Better Life,
Regional Trade & Cultural Center,
Kernel for Regional & National Economy Activation

Better Life through Green Development

Food Supply, Farm Product Trading,
Job Creation, Moderate Living Condition

Regional society

Economy Stimulation, Education & Training

Field Survey, Statistical Data, Resources
Analysis, Scenario Analysis;
Movement for Better Living

Socio-Economical Impacts of RE

Local PV Industry, O&M Company, Infrastructure
for Other Local Industry, Electricity Export

Electricity

Jobs

Sustainable Community



Sustainable PV Stations

VLS-PV (Very Large-Scale PV) Wind, Other Renewables

Abundant Solar Energy;
VLS-PV Concept, Solar & Wind Energy
Storage, Energy Resources Survey, Regionally
Friendly Design; Electricity Export, Local
Industry & Jobs, Shelter Effect, Low
Environmental Impacts

Sustainable Energy Production



Rich Electricity

Water Processing, Sun Shade,
Wind Shelter, Land Temperature Control

Forest, Grassland, Farmland

Farm Conservation, Effective Water Use

Desert Greening, Anti-Desertification, Biological
Diversity Conservation;
Abundant Solar Energy & Vast Land
for saving Man-caused Desertification (87%);
Soil Survey, Material/Water Flow Model,
Soil Improvement Facility

Sustainable Farm



Micro climate
analysis

Water pumping
Desalination

Soil Process
Irrigation

Remote
Sensing

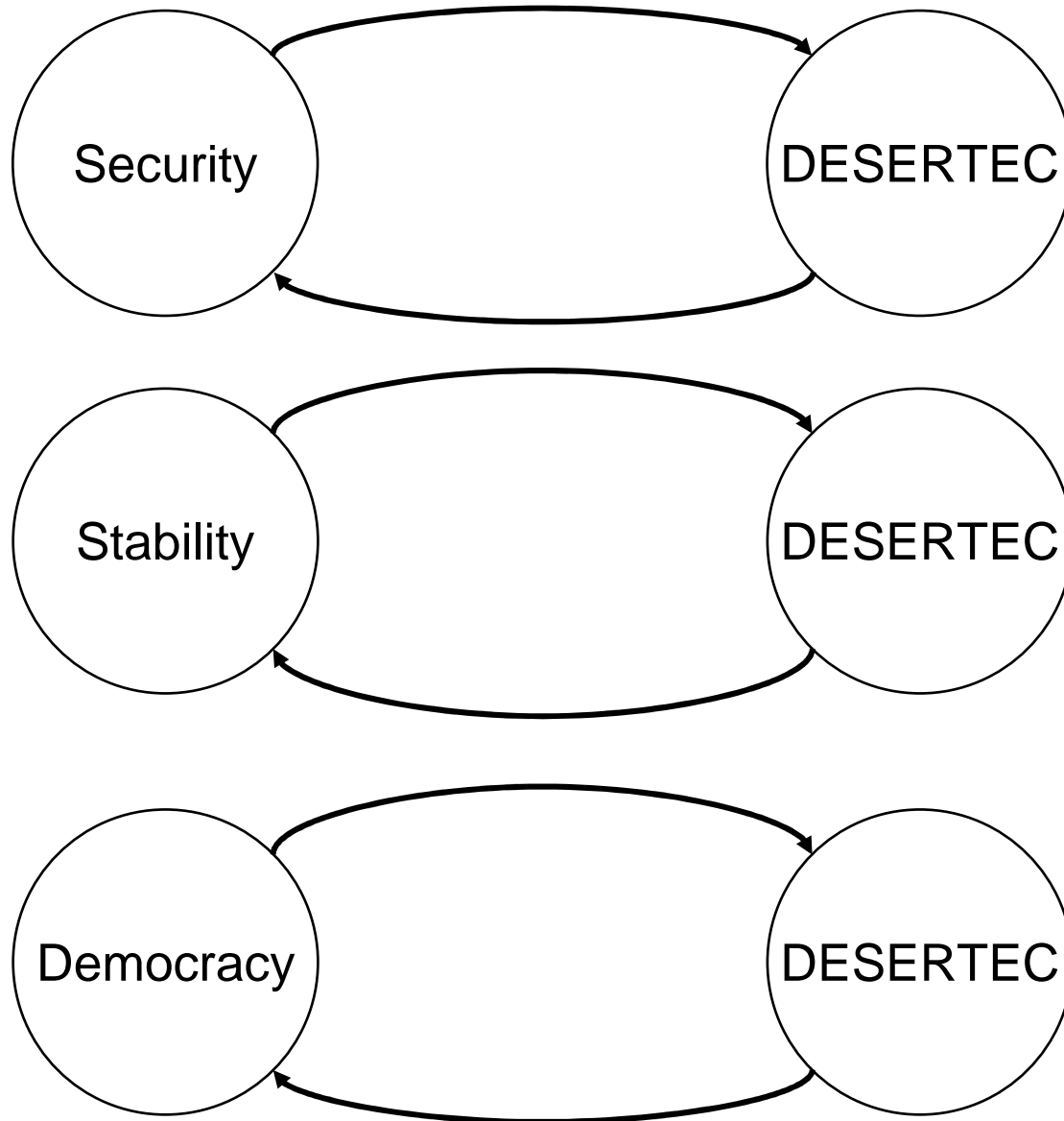
Shelter Effect

Foods, Water,
Climate Control

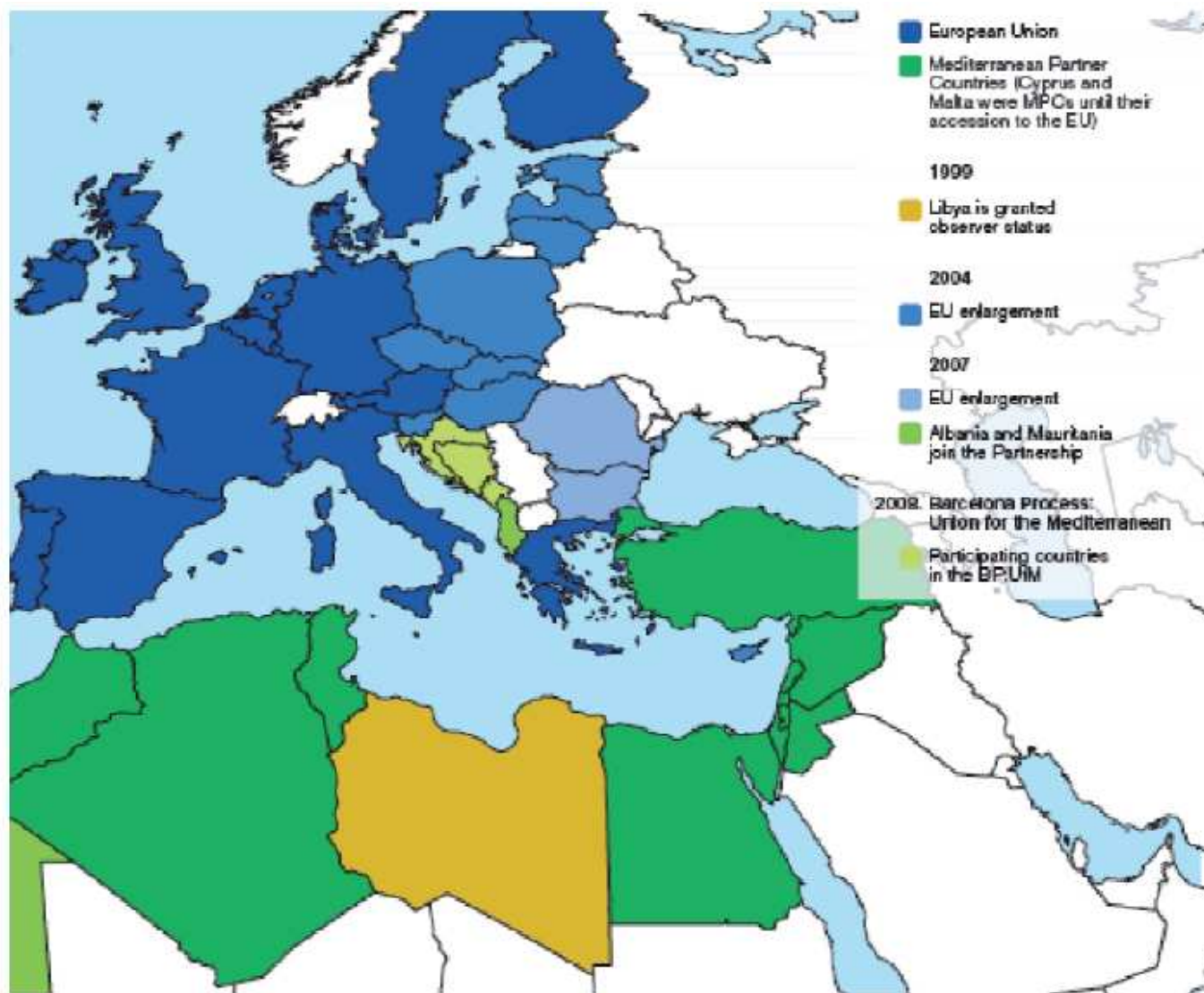
Jobs

Spread out
Nationwide

From obstacle to opportunity



Union for the Mediterranean



Multi-stakeholder standards-setting processes

- **Roundtable on Sustainable Palm Oil (RSPO)**
- **Roundtable for Responsible Soy (RTRS)**
- **SA 8000:** developed by Social Accountability International (SAI)
- **Global Social Compliance Program (GSCP):** initiative of CIES, International Committee of Food Retail Chains, Food Business Forum.
- **Fairtrade**
- **Rainforest Alliance**
- **GlobalGap**
- **IFOAM**
- **Transparency International**

Principles, criteria and requirements: International Sustainability & Carbon Certification (ISCC)

Principles and types of criteria

Principle 1: Biomass shall not be produced on land with high biodiversity value or high carbon stock and not from peat land. HCV areas shall be protected.

Biomass is not produced on land/grassland with high biodiversity value/carbon stock

Biomass is not produced on land that was peat bog in January 2008 or thereafter

Land converted after 1 January 2008, conversion/use should not be contrary to principle 1

Principle 2: Biomass shall be produced in an environmentally responsible way. This includes the protection of soil, water and air and the application of Good Agricultural Practices

EIA,
stakeholder
consultation

Environmental aspects are considered if planning buildings, drainage etc.

Natural water
courses

Natural vegetation areas around springs and natural water-courses are maintained or re-established

Hunting

Hunting done according to local legislation

Principle 2: Biomass shall be produced in an environmentally responsible way

Soil erosion	Field cultivation techniques used to reduce the possibility of soil erosion
Soil organic matter	Soil organic matter is maintained/preserved
	Organic matter, if used, is evenly spread throughout the production area
	There is a restriction on burning as part of the cultivation process
Soil structure	Techniques to improve or maintain soil structure, and to avoid soil compaction
Ground water	Chemicals are stored in an appropriate manner, which reduces the risk of contaminating the environment
Seed/rootstock Quality and origin	Purchased seeds are accompanied by records of variety name, batch number, supplier, seed certification details and are seed treatment records retained
	Home-saved seed have available records of the identity, source, treatments applied (e.g., cleaning and seed treatments)
Irrigation	Producer can justify irrigation in light of accessibility of water for human consumption
	Producer respects existing water rights, both formal and customary
	Producer can justify the method of irrigation used in light of water conservation
	To protect the environment, water is abstracted from a sustainable source
	If ground water is used for irrigation, the level of the ground-water table is monitored
	Advice on abstraction has been sought from water authorities, where required by law
Fertilizer	Competent recommendations for application of fertilizers (organic or inorganic)

Principle 3: Safe working conditions through training & education, use of protective clothing and proper and timely assistance in event of accidents

Workers health,
safety & welfare

The farm has a written risk assessment for safe and healthy working conditions

Farm has health, safety and hygiene policy and procedures including risk assessment

First Aid kits are present at all permanent sites and in the vicinity of fieldwork

Workers (incl. subcontractors) equipped with suitable protective clothing in accordance with legal requirements and/or label instructions or as authorised by competent authority

Protective clothing is cleaned after use and stored so as to prevent contamination of the clothing or equipment

Potential hazards are clearly identified by warning signs and placed where appropriate

Safety advice is available for substances hazardous to worker health, when required

There are records kept for training activities and attendees

Workers handling and/or administering chemicals, disinfectants, PPP, biocides or other hazardous substances and workers operating dangerous or complex equipment as defined in risk assessment have certificates of competence, and/or details of other qualifications

All workers received adequate health and safety training and are they instructed according to the risk assessment

Workers have access to clean food storage areas, designated dining areas, hand washing facilities and drinking water

On-site living quarters are habitable and have the basic services and facilities

Principle 4: Biomass production shall not violate human rights labour rights or land rights. It shall promote responsible labour conditions and workers' health, safety and welfare & shall be based on responsible community relations

A self-declaration on good social practice regarding human rights has been communicated to the employees and signed by the farm management and the employees' representative

Employment conditions comply with equality principles

No discrimination (distinction, exclusion, preference) practiced that denies or impairs equality of opportunity, conditions or treatment based on individual characteristics and group membership or association. Based on race, caste, nationality, religion, disability, gender, sexual orientation, union membership, political affiliation, age, marital status, working status (i.e. temporary, migrant, seasonal), HIV/AIDS

There is no forced labour at the farm

Workers have the freedom to join labour organizations or organize themselves to perform collective bargaining. Workers must have the right to organize and negotiate their working conditions. Workers exercising this right should not be discriminated against or suffer repercussions

The farm pays a living wage which meets at least legal or industry minimum standards

The person responsible for workers' health, safety and good social practice and the elected person(s) of trust have knowledge about and/or access to recent national labour regulations/collective bargaining agreements

All impacts for surrounding communities, users and land owners accounted and sufficiently compensated for

The management does hold regular two-way communication meetings with their employees where issues affecting the business or related to worker health, safety and welfare can be discussed openly

At least one worker or a workers' council elected freely and democratically who represent the interests of the staff to the management

Further principles and criteria

Principle 5: Biomass production shall take place in compliance with all applicable regional and national laws and shall follow relevant international treaties

The producer can proof that the land is used legitimately and that traditional land rights have been secured

There is awareness of, and compliance with, all applicable regional and national laws and ratified international treaties

Principle 6: Good management practices shall be implemented

Record keeping
and internal self
assessment

All records requested during the external inspection are accessible and kept for a minimum period of time of 2 years, unless a longer requirement is stated in specific control points

The producer or producer group takes responsibility to undertake a minimum of one internal self-assessment or producer group internal inspection, respectively, per year against the ISCC Checklist

Effective corrective actions taken as a result of non-conformances detected during the internal self-assessment or internal producer group inspections

Site history and
site management

A recording system is established for each unit of production undertaken at those locations. Are these records kept in an ordered and up-to-date fashion?

Records are kept for the description of the areas in use

<http://www.iscc-system.org/>

Subcontractors

In case of the engagement of subcontractors they must comply fully with the ISCC standard and provide the respective documentation and information

Avoid corruption

Global Corruption Report 2011: None of the 20 countries most affected by climate change score higher than 3.6 on the Corruption Perceptions Index, in which 0 is extremely corrupt and 10 is very clean.

Corruption as barrier to deployment of renewable energy in North Africa.

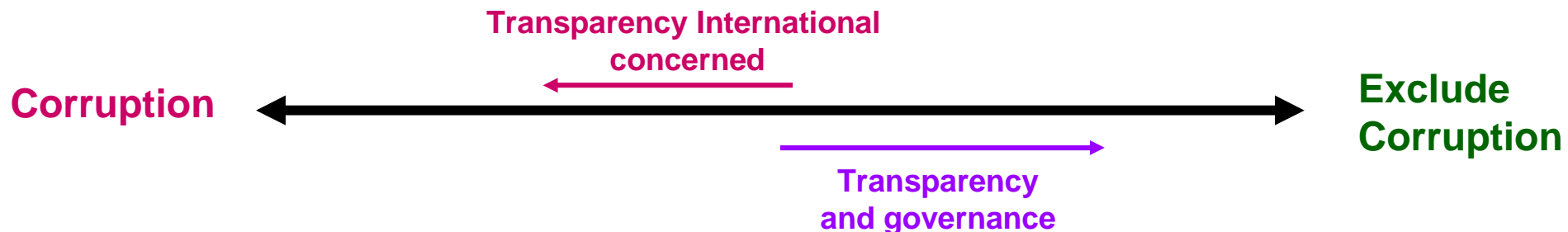
Survey of people from NGOs, academia, private sector, civil service or international organizations from Europe, the US (active in North Africa) and North Africa suggest that corruption is a major problem in the region.

Majority of stakeholders believe that both corruption would likely increase if large volumes of foreign direct investment connected with renewable energy sources come to the region.

→ Risks like officials expecting money and gifts, unauthorized sale of public property and licenses, manipulation of regulations, and misuse of inside knowledge and confidential information.

→ Three quarters see procedures for getting permits as the most problematic area.

→ Corruption may decrease as a result of recent political upheavals.



Recommended actions on corruption for governments, business and civil society

- 1 Incentivize and design key climate policy instruments so as to promote independence and reduce conflict of interest
- 2 Ensure transparency in flows of funding for mitigation and adaptation
- 3 Monitor and oversee national climate policy and projects effectively
- 4 Treat anti-corruption safeguards as integral elements in the design of adaptation and mitigation action
- 5 Step up policy coordination and bring key departments into line on climate change issues
- 6 Build robust mechanisms for representation and public engagement that can cope with the increased public demand
- 7 Be a powerful voice in climate policy through open engagement and disclosure; it is an essential plank of corporate citizenship and a marker of commitment to climate change
- 8 While going green, adhere to strong compliance, an anti-corruption regime and best corporate governance practice
- 9 Commit ample resources to transparency, the disclosure of carbon emissions and green climate action
- 10 Undertake independent oversight and monitoring in terms of governance and corruption risk in climate change issues
- 11 Encourage the public's participation in and oversight of policy development at the local, national and international levels
- 12 Build broader coalitions for integrity in climate governance and ensure that the interests of all stakeholders are represented and taken into account