UNIVERSITY OF CENTRAL ASIA
GRADUATE SCHOOL OF DEVELOPMENT
Institute of Public Policy and Administration

Climate Change: Trends and Adaptation Policies Conducive for Innovation

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OUTLINE

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- Climate Change Adaptation Policy
- Climate Change Adaptation Technologies: Best Practice & Best Fit

Introduction

- Climate change is a main challenge of the 21 century and threaten to development made in the past in Asia, especially in Central Asian countries – Tajikistan, Kyrgyzstan and Afghanistan.
- Fay et.al. (2010) studied a climate change effects in Europe and Central Asia (ECA) region and find that Tajikistan and Kyrgyzstan are most sensitive to climate change and they have least adaptive capacity among 28 countries in the region.
- Climate change are the main challenges for agriculture, human health, water and transportation sectors.
- This presentation deal with state of the art and future of climate change, impact and vulnerability, current adaptation policy and adaptation technologies that better fit for Afghanistan, Kyrgyzstan and Tajikistan, and at the same time conducive for innovation.

Overview of Current & Future Climate Situation

	Afghanistan		Kyrgyzstan		Tajikistan	
	History	Future	History	Future	History	Future
Mean annual temperature	↑ 0.6° C since 1960	1.4° C and 4.0° C by the 2060s; 2.0° C and 6.2 C by the 2090s	0.8°C since 1900	↑ 2°C by 2060 4-5°C by 2100	0.3-1.2 °C since 1940	↑ 2°C by 2050
Average Annual Precipitation	0.5 mm per month per decade since 1960	projected to ↑	Trends in rainfall are unknown	↓ by 12% by 2020	Insignificant, but change in pattern	↓ by 5% by 2050

Source: Climate Change Knowledge Portal.
http://sdwebx.worldbank.org/climateportal/countryprofile/home.cfm?page=country_profile&CCode=AFG&ThisTab=ClimateFuture

Impact & Vulnerability

Afghanistan	Kyrgyzstan	Tajikistan
Drought	Drought	Drought
Water scarcity and water losses	Water scarcity and water losses	Water scarcity and water losses
Avalanches	Changing hydrology condition	Avalanches
Floods	Floods	Outburst floods due to melting glaciers
Landslides	Landslides	Landslides
	Precipitation pattern shift	Precipitation pattern shift

Source: Climate Change Knowledge Portal.
http://sdwebx.worldbank.org/climateportal/countryprofile/home.cfm?page=country_profile&CCode=AFG&ThisTab=ClimateFuture

Climate Change Adaptation Policy

- EBRD, ADB & WB within First Joint Multilateral Development Bank (MDB) in collaboration with Government of Kyrgyzstan & Tajikistan developed Strategic Programme for Climate Resilience in these countries, respectively in 2016 and 2011.
- Climate resilience investment are investments that aim to rationalise water and energy use and promote sustainable land management (ADB, 2014).
- Adaptation to climate change related activities in Tajikistan:
  - Access to information related activities, including train personnel, impact assessment, develop climate-science modules for university curricula;
  - Integrate climate change risk into development programme/projects, including review national, sector programs and national budget, support adaptations plan, design and implement trainings programs, technical support to government;
  - Knowledge management system, including national communication strategy, climate change public awareness campaign, publications and disseminations;
  - Assess baseline and identify indicators and facilitate independent M&E.

Climate Change Adaptation Policy

Example: Pilot Programs for Climate Resilience in Tajikistan

Project title	Thematic focus	Sector	MDB	Funding (US$M)	Cofinancing (US$M)
Building Capacity for Climate Resilience	Climate Information Systems and Disaster Risk Management	Public	ADB	6.0	0.0
Improvement of Weather, Climate and Hydrological Service Delivery	Climate Information Systems and Disaster Risk Management	Public	IBRD	7.0	12.0
Enhancing the Climate Resilience of the Energy Sector	Infrastructure	Private	EBRD	11.0	65.0
Environmental Land and Management and Rural Livelihoods	Agriculture and landscape management	Public	IBRD	9.5	7.4
Building Climate Resilience in the Pyanj River Basin	Water Resources Management	Public	ADB	22.3	0.0
Small Business Climate Resilience Financing Facility	Enabling environment	Private	EBRD	5.0	0.0
Enhancing the Climate Resilience of the Energy Sector. Part of: Private Sector Set-Asides	Enabling environment	Private	EBRD	10.0	0.0

Source: Climate Investment Fund https://www.climateinvestmentfunds.org/projects/building-capacity-climate-resilience

Climate Change Adaptation Technologies

Out of six sectors defined by ADB (2014), where technology solutions ensure climate resilience, five are crucial and relevant for Afghanistan, Kyrgyzstan and Tajikistan. They are:

- Human Health
- Transportation
- Water Resources
- Disaster Risk Management
- Agriculture

Adaptation technologies in these sectors help reduce vulnerabilities due to climate change and lead to innovation.

Climate Change Adaptation Technologies

Technology solution for **health sector**:

- long-lasting insecticidal bed nets (LLINs);
- Rapid diagnostic tests (RDTs);
- Disease surveillance systems;
- e-Health;
- Food-proof sanitary latrines;
- Food-proof drinking water wells;

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies

Technology solution for **transportation sector**:

- Warm-mix asphalt (WMA);
- Engineered cementitious composite (ECC);
- Active motion-dampening systems;
- Intelligent transportation systems (ITSs).

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies

Technology solution for **water sector**:

- Rainwater harvesting;
- Surface-water storage;
- Interbasin water transfer;
- Aquifer recharge;
- Water loss reduction;
- Water demand reduction;
- Desalination;
- Point-of-use (POU) water treatment;
- Wastewater treatment;
- Stormwater management and bioswales;
- Structural barriers to flooding;
- Non-structural barriers to flooding;
- Accommodation of flooding.

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies

The six **Disaster Risk Management (DRM)** technologies are:

- Light detection and ranging (LIDAR);
- Artificial lowering of glacial lakes;
- Monitoring systems;
- Emergency shelters;
- Early warning systems;
- Social media in disaster response.

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies

Technology solution for **agriculture sector**:

- Crop breeding;
- Fungal symbionts;
- Laser land levelling;
- Pressurized irrigation technologies;
- Floating agriculture;
- Improved livestock feed;
- Temperature regulation for livestock.

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies

Each technology should meet the following criterions:

1. **Effectiveness:** reduce vulnerability or increase resilience
2. **Relative cost** score: high, middle, low
3. **Co-benefits:** increasing ecosystem services or creating jobs;
4. **Co-costs**, in contrast to co-benefits, measure the negative consequences of using technology, such as ecosystem destruction or job loss;
5. **Barriers to implementation:** score measures the difficulties standing in the way of technology implementation;
6. **Feasibility of implementation:** internet availability, whether the technology adopted elsewhere and is appropriate for different conditions;
7. **Scale of implementation:** micro, meso and macro
8. **Applicable locations and conditions**: technologies to minimise the drought risk less relevant where increase of precipitation is expected, vice versa;
9. **Potential financing and marketing:** availability of technology from private, academic institution, international organization, co-financing or PPP;
10. **Cross-cutting technologies.**

Source: ADB (2014). Technologies to support climate change adaptation in Asia. Retrieved from https://www.adb.org/sites/default/files/publication/149400/technologies-climate-change-adaptation.pdf

Climate Change Adaptation Technologies: Best Practice & Best Fit

An Example of **technology solution** for agriculture sector:

Reducing Water Use and Water Waste: Laser Land Levelling.

Much of the water loss in agriculture is a result of unnecessary runoff from fields. An important approach to reducing runoff is ensuring that agriculture fields are as level as possible. Recent technologies, including the use of laser technology, have improved the precision of field levelling before planting.

	Technology evaluation scoring method	Effects	Findings
Effectiveness	More desirable	Water conservation; water efficiency; crop yield; better utilization of variable rainfall; Reduced groundwater depletion;	Singh et al. 2009; Lybbert and Sumner 2012; Akhtar 2006; Naresh et al., 2011; Kahlon and Lal 2011

More desirable = less than $100 per ha

Intermediate = $100–$500 per ha

Less desirable = more than $500 per ha.

Climate Change Adaptation Technologies: Best Practice & Best Fit

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Reducing Water Use and Water Waste: Laser Land Levelling.

	Technology evaluation scoring method	Effects	Findings
Relative cost	More desirable	Only once in few years at cost $6–$13 per hour; Time & resource saved.	Lybbert et al. 2012; Ahmad, Khokhar & Badar, 2001.
Co-benefits	More desirable	Zero tillage and bed planting; Reduce irrigation time by 2–5 hours per ha; Fertilizer efficiency & lessen reliance on diesel pumps; Save 1.5 million hectare/meters of irrigation water & up to 200 million liters (equal to US$1,400 million) [of diesel], and improve crop yields [by up] to US$500 million in three years and reduce greenhouse gas emissions [by up] to 500 million kilograms" Create new skilled jobs in agricultural regions	Naresh et al. 2011; Singh et al. 2009; Lybbert and Sumner 2012; Lybbert et al. 2012. Jat et al. 2006.

Climate Change Adaptation Technologies: Best Practice & Best Fit

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Reducing Water Use and Water Waste: Laser Land Levelling.

	Technology evaluation scoring method	Effects	Findings
Co-cost	More desirable	Laser land levelling is an ideal technology because it does not involve a high level of risk & "more level plots are unambiguously better than less level plots"	Lybbert et al. 2012.
Barriers	More desirable	The need for further studies to determine any long-term effects is the often-cited barrier to the use of this technology.	Naresh et al. 2011
Feasibility of implementation	Intermediate	Because laser land levelling can be done on a contractual basis, individual farmers will not have to purchase their own equipment to benefit from the technology, provided that enough capable contractors and technological resources are available within a region.	

Climate Change Adaptation Technologies: Best Practice & Best Fit

An Example of **technology solution** for agriculture sector:

Reducing Water Use and Water Waste: Laser Land Levelling.

	Technology evaluation scoring method	Effects	Findings
Scale of implementation	More desirable	E.g. in Uttar Pradesh, 7 years after laser land levelling was introduced, the number of levellers had increased to 925 and 200,000 hectares of land had been levelled with the help of the technology	Lybbert et al. 2012
Applicable locations & conditions	More desirable	Particular usefulness of laser levelling technologies in flood irrigation	Lybbert and Sumner 2012
Potential Financing & Market	More desirable	This model offers great entrepreneurial potential in agricultural regions	Lybbert et al. 2012

THANK YOU!

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