Proceedings of Fifth International Conference on Climate Change Adaptation 2016

Unique Conferences Canada

Proceedings of
Fifth International Conference on
Climate Change Adaptation 2016

15 - 16 October, 2016

Toronto Canada

Unique Conferences Canada Publication
Toronto, Canada

Published by

Unique Conferences Canada

Unique Conferences Canada
Suite 2201, 250 Young Street,
Toronto ON M5B 2L7
Canada

info@uniqueca.com
http:// www.uniqueca.com

December 2016

ISBN 978-1-988652-02-3

Fifth International Conference on Climate Change Adaptation 2016

CCA2016

HOSTING ORGANIZATION

Unique Conferences Canada

CONFERENCE ORGANISER

International Center for Research & Development

International Scientific committee

Prof. Dr. Walter Leal (Germany)

Prof. W. Malalasekera (United Kingdom)

Prof. Chris Huggins (Canada)

Dr. P.B. Dharmasena (Sri Lanka)

Dr. S. Sivalingam (Australia)

Dr. Risa Morimoto (France)

Prof. K.Karunathilaka (Sri Lanka)

Prof. Ramani Jayathilaka (Sri Lanka)

Prof. Hansjochen Ehmer (Germany)

Prof. Kazuya Yasuhara, (Japan)

Dr. Rasheed Sulaiman (India)

Prof. Zhihua Zhang (China)

Unique Conferences Canada

DISCLAIMER:

All views expressed in these proceedings are those of the authors and do not necessarily represent the views of, and should not be attributed to, the Unique Conference Canada.

The publishers do not warrant that the information in this report is free from errors or omissions.
The publishers do not accept any form of liability, be it contractual, tortuous, or otherwise, for the contents of this report for any consequences arising from its use or any reliance place on it.
The information, opinions and advice contained in this report may not relate to, be relevant to, a reader's particular interest.

Unique Conferences Canada

Email: info@uniqueca.com
Web: www.uniqueca.com

Table of Contents

SYSTEMATIC REVIEW OF THE RESEARCH ON CLIMATE CHANGE ADAPTATION POLICIES AND PRACTICES IN THE LEAST DEVELOPED COUNTRIES WITH SPECIAL REFERENCE TO NEPAL

Shree K. Maharjan* and Prof. Keshav L. Maharjan,

Graduate School of International Development and Cooperation, Hiroshima University

Abstract

Climate change is a reality, especially; least developed countries (LDCs) including Nepal are facing direct and immediate impacts, because of limited adaptive capacities and resources to address it. The governmental, non-governmental agencies, communities and individuals have initiated the adaptation policies and practices as appropriate based on their capacities and available resources. The governments in LDCs have formulated NAPA and relevant policies, plans and frameworks to address the impacts. This paper has reviewed and analyzed the research concentrating on climate change adaptation policies and practices in the LDCs, especially focusing Nepal, through systematic review and analysis approach. The review is concentrated mainly on the peer reviewed journal articles published in Science Direct (SD), Springer Link (SL) and Web of Knowledge (WoK) from period of January 2007 to May 2016. The paper has analyzed the existing research in relation to methodologies, adaptation choices, identifying gaps and priorities. The analysis shows the increasing trend of research on adaptation policies and practices in Nepal either carried out by the agencies or researchers. Among the research, 75% articles have concentrated to adaptation practices and 25% on adaptation policy. Diversification is the most common adaptation practice with 71% articles followed by a combination of more than 2 adaptation practices. Mostly combined research methodologies are used in the research; however, specific research tools and models are also applied to specific research objectives.

Keywords: *climate change, adaptation practices, and policies, systematic review, NAPA, Nepal*

1. Introduction

Climate change is a complex phenomenon with multiple and direct/indirect impacts on the social, economic and environment sectors (Tanago et al., 2016). The least developing countries (LDCs) are relatively more vulnerable (UNDP, 2011) since they have limited capacities and resources to deal with it socially, technologically and financially. It is predicted that billions of people in these countries suffer from its impacts because of food and water shortages and health related issues (UNFCCC, 2007). It is a reality now also in Nepal because of its fragile economy and marginal environment (Gentle and Maraseni, 2012). The impacts are being observed at the national and local levels, however, severe impacts at the local level, especially in the remote and fragile areas where poor and marginalized people live and are highly depended on climate-sensitive livelihood sectors (Manandhar et al., 2011; Aryal et al., 2014; Parera et al., 2015). Moreover, they have limited livelihood options and adaptive capacities due to lack of access to information, resources and services (Gentle and Maraseni, 2012). The situation will be severe with increased mean annual temperature by 1.2^{o}C by 2030, 1.7^{o}C by 2050 and 3^{o}C by 2100 compare to the baseline of 2000 (MoE, 2010) that indicates the increase of substantial impacts on the people's livelihoods in the foreseeable future (Becken et al., 2013).

In recent years, adaptation has become widely discussed in climate change and development discourses including policy and governance (Sharma, 2011). Adaptation is the urgent priority for the LDCs to deal with climate change issues. The LDCs carried out the assessment of vulnerabilities, climate change impacts and developed possible adaptation policies i.e., National Adaptation Programme of Actions – NAPAs (UNFCCC, 2007). The Government of Nepal (GoN) has also formulated the NAPA, Local Adaptation Plan of Actions (LAPAs), National climate change policy-2011 to deal with such climate change impacts at the national and local levels (MoE, 2010; Regmi and Karki 2010; Regmi et al., 2016).

Lwasa (2015) and Tanago et al., (2016) realized the increased number of research on climate change, vulnerability assessment and adaptation that are conducted at different scales (from global to the local) and sectors (eg. agriculture, forestry, health, energy). Each of the research contributes to policy, awareness and capacity building to deal with specific and key climate issues in different scales and sectors (UNFCCC, 2004). However, it is mostly top-down and scenario-driven rather than bottom up and vulnerability driven (Locatelli et al., 2008). Combination of the approaches is effective for detail assessment of adaptation practices and policies (Manandhar et al., 2013). Thus, Berrang-Ford, et al., (2015) emphasized on the policy review and research as it has significant role in the effective implementation of climate policies.

These researches are important to develop the most effective strategies to adapt or mitigate its causes and impacts (EC, 2006). Many research approaches and methodologies are existing to assess climate change impacts, vulnerabilities and adaptation policies (UNFCCC, 2004). Each methodology and approach has specific scope and limitation (Manandhar et al., 2013). Thus, the comprehensive review and synthesis of existing research methods and tools are needed to evaluate the adaptation processes, policies, achievements and gaps (Berrang-Ford et al., 2015). There was very little research on the systematic climate data and review process (Manandhar et al., 2013). The systematic review is a promising tool for comprehensive review, research synthesis and rigorous characterization of vast knowledge and resources to identify research gaps (Higgins and Green (eds.) 2011; Berrang-Ford et al., 2015; Sud et al., 2015).

This paper attempts to systematically review, assess and analyze the existing research on adaptation policies and practices in LDCs with the special emphasis to Nepal. The comprehensive assessment and review of existing research have led to identifying the gaps and priorities in adaptation policies and practices. The paper also analyzes the methodologies used in adaptation research and major adaptation practices being implemented in Nepal. The findings of this study will contribute to effective planning, designing and executing adaptation policies, practices and interventions in Nepal in future.

2. Methodology

The suitable research methodology depends on the research focus and questions as well as issues, sectors and timeframe (UNFCCC, 2007; Locatelli et al., 2008). This study adopted the systematic review, a relatively new methodology in the climate change discourse (Sud et al., 2015), focusing on research related to adaptation practices and policies in the LDCs, specifically emphasizing on Nepal. The study focuses on the peer-reviewed journal papers published in ***Science Direct (SD)***, ***Springer Link (SL)*** and ***Web of Knowledge (WoK)***. These databases are commonly used search engines by the researchers around the world. The inclusion/exclusion criteria and keywords are defined to identify the peer-reviewed papers relevant to the study objectives. The criteria are basically peer-reviewed papers in *SD*, *SL* and *WOK* published from January 2007 to May 2016 in English language. The keywords used to identify the papers are *"climate change adaptation in the least developed countries"* in the first search. The total number of journal articles found are 9395, 7389 and 176 in SD, SL, and WoK respectively, but openly accessed articles are 891, 961 and 176 respectively. The second search with the keywords *"climate change adaptation policies and practices in LDCs"* further narrow down the articles to 562 (SD), 588 (SL) and 16 (WoK) The keywords *"climate change adaptation in Nepal"* are used for the third search. Subsequently, the number of articles found are 415 (SD), 62 (SL), and 88 (WoK). The succeeding keywords used are 'ADAPTATION + POLICIES + PRACTICES + NEPAL' to refine the search further. That ultimately reduced the number of articles to 203 (SD), 39 (SL) and 20 (WoK).

The title and abstract are reviewed considering the relevance and research focus. A total of 37 articles are selected for systematic review. However, 5 articles are accessible only for the abstracts, thus, discarded for the detail review. Finally, 32 articles (10 in SD, 9 in SL, 4 in WoK and 9 reflected in 2 or more databases) are selected for the systematic review. Among them, 6 articles are reflected in WoK and SL; 2 articles are reflected in WoK and SD and only 1 article is reflected in all three sources of databases. The title of the papers, journals, author(s) names, published dates, document sources, research focus, approaches, methodologies and results, analysis are exported, analyzed and summarized using MS Excel. Some researchers such as Gough et al., (2012) have criticized the

possible bias towards systematic review based on predefined keywords and inclusion/exclusion criteria. However, Berrang-Ford et al., (2015) argued that it has adapted the systematic approaches to meet the needs of the review by combining quantitative and qualitative analyses and simplifying the complex and iterative literature searches.

3. Results and Discussions

3.1. Analysis of the trend and research focus areas

The review of the articles published in the databases clearly indicated the increased in the number of research in climate change adaptation policies and practices over the years. SD clearly shows the increasing trend, whereas WoK (26 articles) has highest articles in 2014 and SL (14 articles) in 2013. The number of articles published in SD is comparatively higher than WoK and SL (Figure 1). Large number of search databases is available with many peer reviewed articles published in these databases. However, number of peer reviewed articles relating to climate change adaptation practices and policies particularly in Nepalese context are less in comparison to the papers in other LDCs. But, the trend is increasing over the years as government and other agencies have focused on climate change research in recent years. Lwasa (2015) also reported the similar increasing trend of research in climate change in other countries in South Asia and Africa.

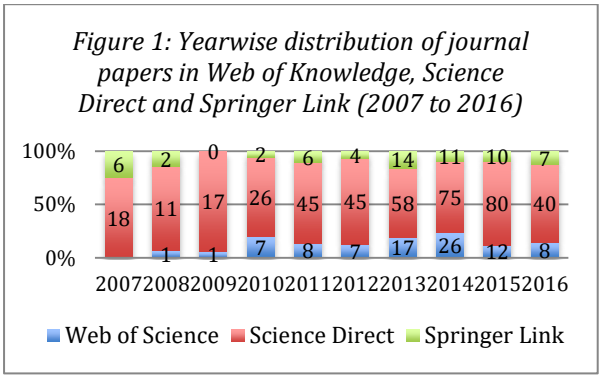

Figure 1: Yearwise distribution of journal papers in Web of Knowledge, Science Direct and Springer Link (2007 to 2016)

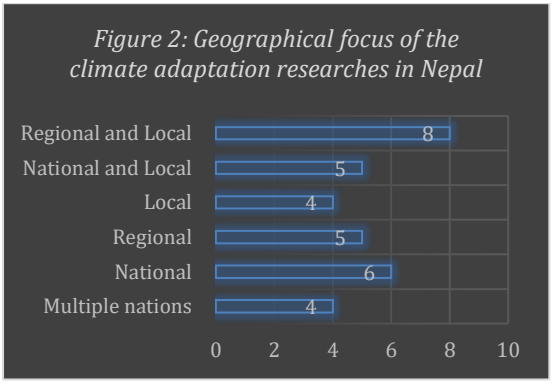

Figure 2: Geographical focus of the climate adaptation researches in Nepal

In terms of no. of articles published in the journals in these databases, *Global Environmental Change* (27) in SD, *Climatic Change* (6) and *Regional Environmental Change* (6) in SL and *Regional Environmental Change* (7) in WoK have the highest number of articles. Diverse research areas and topics are covered in these databases. The major research areas covered in the databases are *Environmental Science and Ecology*, *Geography*, *Biological Conservation* in WoK; *Climate change*, *Climate*, *Energy*, *Water* in SD; and *Environment*, *Environmental Management*, *Earth Science*, *Ecology* and *Life Science* in SL. These are broad research areas; however, it clearly indicates that climate change discourse is multi-disciplinary in nature.

3.2. Adaptation Focus and categories/types

The articles are analyzed broadly based on 5 adaptation categories defined by Agrawal and Perrin (2008) – *Diversification*, *Mobility*, *Storage*, *Market Exchange* and *Communal Pooling*. Among the articles selected, 62.5% are related to adaptation practices, 12.5% are directly related to adaptation policies, 12.5% are related both adaptation practices and policies and rest are focused on disasters, drought and trend analysis though only few information directly relating to adaptation policies and practices. Diversification is the most common adaptation choice among the papers published, as 71% of the articles are concentrated on it. A combination of two or more adaptation choices is generally available (40% of the articles). Very few papers are targeted to specific adaptation choices such as communal pooling (9), market exchange (7), Mobility (6) and storage (2).

Most of the articles (except 7 articles) have multi-authorships. Out of 32 peer-reviewed papers, 6 articles published in Regional Environmental Change. Likewise, Climatic Change, Applied Geography, Global Environmental Change have 3 articles each. Natural Hazards and Environmental Management have only 2 articles published. Rest of the journals such as Water Resources and Rural

Development, Renewable Energy, Weather and Climate Extremes, Environmental Development, Procedia Social and Behavioral Sciences, Environmental Science Policy, World Development, Climate and Development, Mountain Research and Development, International Journal of Global Warming, Climate Policy, Geo-environmental disaster and Journal of Mountain Science have only one paper each.

3.3. Thematic and Geographical Focus/Coverage of the researches

The geographical focuses of the research are mainly categorized into multiple nations (MN), National (N), Regional (R), Local (L), the combination of National and Local (N and L) and finally the combination of Regional and Local (R and L). In this regards, 4 articles have specifically covered multiple nations including Nepal. Among them, 2 articles are focused in the mountainous region and rest 2 are focused on adaptation in general. Moreover, 25% research concentrated in regional and local level, 15% in national and local, 12.5% in local, 15% in regional and 19% in national level (Figure 2).

In terms of thematic focus, most of the articles have concentrated on agriculture and livelihoods, livestock and water resources. Moreover, 2 articles have specifically focused on gender and 2 on disaster risk reduction correspondingly. There are 8 articles related to adaptation policy. Only 1 article is found that is focused on renewable energy sector and drought specifically.

3.4. Methodological and Analytical Approaches

3.4.1. *Approaches*

In order to analyze the approaches, the authors have defined 3 types of approaches – Descriptive, Explanatory and Analytical. Descriptive implies use of simple descriptive analysis such as mean and percentage, whereas explanatory is basically included literature review, qualitative explanation and Analytical indicates the use of model and quantitative analysis. In this aspect, 13 articles have concentrated on combination of descriptive and analytical approaches. Likewise, 9 papers have used explanatory approach. Similarly, 4 articles have used descriptive and combination of descriptive and explanatory respectively and only 2 articles have used only analytical approach.

3.4.2. Research methods and data analysis

It is found that combinations of multiple methods are being applied in the climate change research in Nepal. In this review, the combination of HH Survey, Questionnaire Survey and Participatory methods found very prominent. However, some research have used specific tools and techniques such as Livelihood Vulnerability Index; Long-range energy alternative planning Model (LEAP); Participatory 3-Dimensional Mapping (P3DM); discourse analysis; Multivariate Probit Model; Spatio-temporal trend analysis; Land evaluation framework; Binary Logit Model, DHM[1] and SPI analysis among others.

In terms of data analysis, out of total articles selected for review, 12.5% research solely depends on quantitative analysis, 37.5% research have combined both qualitative and quantitative analyses and rest 50% depend on qualitative analysis of the available information. Some of them are review paper published in the peer-reviewed journals. Berrang-Ford et al., (2015) has pointed out that there is the limited systematic review done in terms of quantitative and even formal qualitative evaluations of adaptation policy and practice.

3.5. Discussions

This review systematically analyzed the research on adaptation policies and practices in LDCs, specially highlighting the case of Nepal. Based on the comprehensive assessment and review, the objectives of identifying gaps and priorities and gaps in adaptation policies and practices were comprehended. Agriculture and livelihoods are the main priorities in the adaptation research. However, combinations of adaptation choices are also common. Tennigkeit et al., (2014) also revealed that adaptation is the main priority in the agriculture sector in LDCs. It is mainly because agriculture and natural resources are more vulnerable to climate change, thus important to focus on

[1] *DHM - Department of Hydrology and Meteorology and SPI – Standardized Precipitation Index*

these sectors to formulate rational and effective adaptation strategies (Tao et al., 2011). Moreover, Gautam and Peterson (2016) also found livelihood diversification as the most common adaptation strategy in dealing with economic and environmental shocks. Agrawal and Perrin (2008) have found very few adaptations relating to market exchange and storage among 118 types of adaptation types. Tiwari et al., (2014) have also found that some of these adaptation programs of government and NGOs have improved the livelihoods of the poor and vulnerable people through pro-poor programs at the local level.

Moreover, because of the greater priorities, there is a possibility of higher number of research being conducted on agriculture and livelihoods as compared to others that are reflected in the peer-reviewed domain. Additionally, all research are not reflected in these databases, since there are different types and levels of research. For instance, many local level and policy research are not reflected in these databases. Sud et al., (2015) also agree that all research on adaptation, especially policies related, may not in the peer-reviewed domain. Moreover, few studies have systematically examined adaptation practices and actions at national, regional and local levels (Ford et al., 2011). Thus, the UNFCCC has emphasized on assessing climate change impacts and vulnerabilities for identifying adaptation needs and priorities in all sectors. The systematic data gathering, observation, monitoring and forecasting through research and documentation are necessary for good quality data and information (UNFCCC, 2007).

The review shows the increasing trends of research and publications in the peer-reviewed journals in the field of climate change adaptation in LDCs including vulnerability assessments and adaptations that was also reported by Lwasa (2015) and Tanago et al. (2016). European Commission (EC) has also increased three-fold funding support on climate change research in developing countries from 2007-2013 (EC, 2006). It has been observed that many researchers have combined the diverse sectors such as agriculture, water, livestock, gender, and poverty in climate change adaption. The upfront reason is that climate change has multiple impacts in diverse sectors from agriculture to forestry, water to energy, health to the economy. It is necessary to adapt and adjust appropriately to cope with the present and future uncertainties (UNFCCC, 2007). The researchers have used a wide range of research methodologies based on research issues and focus, which vary with the sectors, researchers' skills and interests. However, the combination of research methodologies is prominent, utilizing both qualitative and quantitative data. Moss et al., (2001) emphasized on the necessity of multifaceted, interdisciplinary approaches for assessing vulnerability and understanding social, environment and economic impacts. Some specific set of tools and methods are also applied to specific research such as P3DM for studying gender and multi-castes collaboration, LEAP for energy alternative planning model.

There are only 8 papers (25%) directly related to adaptation policies. The climate change policy in Nepal has a very short history, which was begun only after formulation of NAPA in 2010. It's the newest addition to Nepal's legislative framework (Tiwari et al., 2014). The climate change policy, LAPAs are developed specifically to implement the NAPA priorities and projects. However, it is still a challenge to implement all those priorities/projects. Some initiatives have been started with Nepal Climate Change Support Programme (NCCSP) in 14 districts of mid and far-western development regions (GoN, 2016). These climate change policies have specifically allocated 80% funds to the local level particularly for poor and vulnerable people (Tiwari et al., 2014). Most of the policy related articles in the review are found to be explanatory and qualitative in nature.

4. Conclusions and way forward

The climate research is being conducted at different levels and sectors in the LDCs. The systematic review is effective particularly in identifying the gaps and priorities. However, this study is limited only to the research published in SD, SL, and WoK. However, it shows the increasing trend of research on adaptation practices and policies in Nepal. Since the systematic review is a newly emerged tool in climate change discourse, there are very few such review conducted in the LDCs and also in Nepal. The review found that the combination of different research methodologies including survey (household and questionnaire); participatory approaches and model analysis are commonly applied, utilizing primary and secondary sources of data through qualitative and quantitative analyses based on the nature of research, availability of data/information and research objectives including researchers' skills and abilities.

The research is a continuous process, however, it is more important to utilize the research findings and recommendations in the livelihood improvement of the poor and marginalized people to minimize climate risks and vulnerabilities. In that aspect, the finding and analysis of this review can contribute to minimizing the gaps and priorities in adaptation research in the LDCs including in Nepal. The review has found diversification as the most common adaptation, especially in agriculture and livelihood sector, since climate change impacts are severe in these sectors. There might be very few research focusing other thematic areas/sectors or the research that are not published in these databases. In that sense, the systematic review needs to combine with review and analysis of some other published and unpublished literature on the related field, especially when the field is new such as climate change policy in most of the LDCs. In Nepalese context, limited research are done on climate change policies, which are mostly explanatory. The policy in Nepal has very short history. Thus, policy survey on adaptation policy with the climate experts is one of the potential research fields in near future in Nepalese context.

References

Agrawal, Arun, and Perrin, Nicholas. 2008. Climate adaptation, local institutions and rural livelihoods. *IFRI Working Paper # W081-6*, International Forestry Resources and Institutions Program, Natural Resources and Environment, University of Michigan

Aryal, Suman, Cockfield, Geoff, and Maraseni, Tek Narayan. 2014. Vulnerability of Himalayan transhumant communities to climate change. *Climatic Change*. Vol. 125, pp. 193-208. DOI: 10.1007/s10584-014-1157-5

Becken, Sussane. Lama, Anu Kumari and Espiner, Stephen. 2013. The cultural context of climate change impacts: Perceptions among community members in the Annapurna Conservation Area, Nepal. Environmental Development. Vol 8, pp. 22-37. http://dx.doi.org/10.1016/j.envdev.2013.05.007

Berrang-Ford, Lea, Pearce, Tristan and Ford, James D. 2015. Systematic review approaches for climate change adaptation. *Regional Environmental Change*. Vol. 15, no. 5, pp. 755-769. DOI 10.1007/ s10113-014-0708-7

Ford, James D., Berrang-Ford, Lea, and Paterson, Jaclyn. 2011. A systematic review of observed climate change adaptation in developed nations. Climatic Change. Vol. 106, no. 2, pp. 327-336. DOI: 10.1007/s10584-011-0045-5

European Commission (EC). 2006. EU action against climate change: helping developing countries cope with climate change. Office for Official Publications for the European Committees. ISBN 92-79-02528-7

Gautam, Yograj. and Anderson, Peter. 2016. Rural livelihood diversification and household well-being: Insights from Humla, Nepal. *Journal of Rural Studies*. Vol. 44, pp. 239-249. http://dx.doi.org/101016/j.jrurstud.2016.02.001

Gentle, Popular, and Maraseni, Tek Narayan. 2012. Climate change, poverty and livelihoods: Adaptation practices by rural mountain communities in Nepal. *Environmental Science and Policy*. Vol. 21, pp. 24-34. http://dx.doi.0rg/10.1016/j.envsci.2012.03.007

Government of Nepal (GoN). 2016. NCCSP in Brief. Government of Nepal, Ministry of Population and Environment (MoPE), Nepal Climate Change Support Programme. Retrieved from http://www.nccsp.gov.np/en/aboutus/nccspinbrief.html on 24 May 2016.

Gough, David. Thomas, James. and Oliver, Sandy. 2012. Clarifying differences between review designs and methods. Systematic Review. Vol. 1, no 28. DOI: 10.1186/2046-4053-1-28

Higgins, Julian. P. T., and Green, Sally. (eds.). 2011. Cochrane Handbook for systematic reviews of interventions version 5.1.0. *The Cochrane Collaboration*. [Available from www.cochrane-handbook.org, accessed on 15 Jan 2016]

Locatelli, Bruno. Herawa, Hety. Brockhaus, Maria. Idinoba, Monica. and Kanninen, Markku. 2008. Methods and tools for assessing the vulnerability of forests and people of climate change: *Working Paper, Center for International Forestry Research (CIFOR)*. www.cifor.cgiar.org

Lwasa, Shuaib. 2015. A systematic review of research on climate change adaptation policy and practice in Africa and South Asia deltas. *Regional Environmental Change*. Vol. 15, pp. 815-824, DOI 10.1007/s10113-014-0715-8

Manandhar, Sujata. Pandey, Vishnu Prasad. and Kazama, Futaba. 2013. Climate change and adaptation: An integrated framework linking social and physical aspects in poorly gauged regions. *Climate change*. Vol. 120, no. 4, pp. 727-739, DOI 10.1007/s10584-013-0842-0

Manandhar, Sujata. Vogt, Dietrich Schmidt. Perret, Sylvain R. and Kazama, Futaba. 2011. Adapting cropping systems to climate change in Nepal: A cross-regional study of farmers' perception and practices. *Regional Environmental Change*. Vol. 11, pp 335-348, DOI: 10.1007/s10113-010-0137-1

Ministry of Environment (MoE). 2010. National adaptation program of actions (NAPA) to climate change. Ministry of Environment, Government of Nepal

Moss, Richard H., Brenkert, A. L., and Malone Elizbeth L. 2001. Vulnerability to climate change: A quantitative approach. PNNL-SA-33642. US Department of Energy, Under the Contract DE-AC06-76RLO 1830

Parera, E. Duminda. Hiroe, A., Shrestha, Dibesh. Fukami, K., Basnyat, D. B., Gautam, S., Hasegawa, A., Uenoyama, T., and Tanaka, Shigenobu. 2015. Community-based flood damage assessment approach for lower west Rapti River Basin in Nepal under the impact of climate change. *Natural Hazards*. Vol 75, pp. 669-699. DOI: 10.1007/s11069-014-1339-5

Regmi, Bimal R. and Karki, Gyanendra. 2010. Local Adaptation Plans in Nepal. *TIEMPO*. www.tiempocyberclimate.org

Regmi, Bimal R., Star, Cassandra. and Leal Filho, Walter. 2016. Effectiveness of the local adaptation plan of action to support climate change adaptation in Nepal. *Mitigation Adaptation Strategy Global Change*, Vo. 21, pp. 461-478, DOI 10.1007/s11027-014-9610-3

Tao, Shengcai. Xu, Yinlong. Liu, Ke. Pan, Jie. and Gou, Shiwei. 2011. Research progress in agriculture vulnerability to climate change. *Advances in climate change research.* Vol. 2, no. 4, pp. 203-210. DOI: 10.3724/SP.J.1248.2011.00203

Sharma, Sundar Kumar. 2011. The political economy of climate change governance in the Himalayan region of Asia: A case study of Nepal. *Procedia Social and Behavioral Sciences*. Vol. 14, pp. 129-140. DOI: 10.1016/j.sbspro.2011.03.030

Sud, Ridhima. Mishra, Arabinda. Varma, Navarun. and Bhadwal, Suruchi. 2015. Adaptation policy and practice in densely populated glacier-fed river basins of South Asia: A systematic review. *Regional Environment Change*. Vol. 15, pp. 825-826, DOI 10.1007/s10113-014-0711-z

Tanago, Itziar Gonzalec, Urquijo, Julia. Blauhut, Veit. Villarroya, Fermin. and Stefano, Lucia De. 2016. Learning from experience: systematic review of assessments of vulnerability to drought. *Natural Hazards*. Vol. 80, pp. 951-973, DOI 10.1007//s11069-015-2006-1

Tennigkeit, Timm. Wilkes, Andreas. Parker, Charlie. and Kossam, Fred. 2014. Climate change and agriculture in LDCs, LDC Paper Series, ecbi Publications and Policy Analysis Unit for LDC Group.

Tiwari, Krishna R., Rayamajhi, Santosh. Pokharel, Ridish K. and Balla, Mohan K. 2014. Does Nepal's climate change adaptation policy and practices address poor and vulnerable communities? Journal of Law, Policy and Globalization. Vol. 23, pp. 28-38. ISSN 224-3240 (paper) ISSN 2224-3259 (online)

UNDP. 2011. Climate change in Least Developed Countries. Fast Facts, United Nations Development Programme (UNDP). www.undp.org/climatechange

UNFCCC. 2004. Application of methods and tools for assessing impacts, vulnerabilities, and developing adaptation responses: Background paper. FCCC/SBSTA/2004/INF.13. Germany, www.unfccc.int/resource/docs/2004/sbsta/inf.13.pdf [retrieved 14 Jan 2016]

UNFCCC. 2007. Climate change: Impacts, vulnerabilities and adaptation in developing countries. United Nations Framework Convention on Climate Change Secretariat, Martin-Luther-King-Strasse 8, Bonn, Germany. www.unfccc.int