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Production of Nature

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ABOUT THE CONTRIBUTORS

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'PRODUCTION OF NATURE'
INTERROGATING DEVELOPMENT

The Second International Conference of the Department of Environmental Science and Policy, Lahore School of Economics titled 'Production of Nature' was held in December 2016. The conference invited empirical and theoretical papers to investigate the emerging environment in the throes of global climate change, accumulating waste, loss of biodiversity, emergence of new diseases, devastating wars, forced migrations and economic crisis through an integrated socio-historical perspective. The following selection of conference papers examine a broad range of local and global issues and serves as a window into the socio-material production of our times. Increasingly we live and are part of a socially 'produced nature'; hybrid life forms sustain us and artificial materials create environments for living structured by prevailing socio- economic and political regimes.

Soha and Fizza offer a grounded account of the impact of change to English as medium of instruction (EMoI) on the environment of learning in government schools of Punjab. This paper is significantly revealing about the nature and role of language in a learning environment. Language is not a finite tool but a living entity embedded in a social realm. Most discourse about the medium of instruction neglects the social class of students and teachers and negates their empirical experience and agency as stakeholders in policy making. Teaching local students in foreign medium of instruction in private schools is nothing new to Pakistan. However, in 2009 the Government of Punjab took the major decision of changing the Urdu medium of instruction to English in 56000 government schools, ostensibly to provide equal opportunity in a globalized world to lower class students who now study at the government schools. The experiment failed miserably and forced the state to abandon implementation of the policy while not announcing a formal reversal of the same. The government, British Council and many assessing organizations ranked the poor quality and competence of teachers as a major hindrance to the successful implementation of the change in medium of instruction. Soha and Fizza have come up with findings which are as interesting as they are significant. First, they conclude, the experiment failed because the student cognition dropped precipitously with instruction in a foreign language even though the government tried to provide the students the relatively easy route of multiple choice questions etc. Second, they found the teachers were not responsible for the failure. On the other hand, the two authors found them dedicated and involved. Third, English for students was a distant foreign language, it was not even a regional language, and finally, it was the social class of government school students. The class differentiation of students in schools is now near complete. Only the poorest students still remain in government schools and English is far removed from the social class and home environment of

these children. They are children of hawkers, daily wagers and maids some of whom come without breakfast, are malnourished and do piecework or wage labour after school hours. For them EMoI holds only further deprivation from education, knowledge and confidence. The article incorporates quotes from the interviewed teachers. Although translation is offered their interesting comments in Urdu have been kept for the Urdu readership. It may also be interesting and quite startling to know that one effect of change to English medium is a decline in the reading and writing of Urdu. Quite apart from the role of language as MoI, we can say Soha and Fizza have rediscovered the public school teacher.

Anika Khan addresses the role of internet in the lives of adolescents, particularly the immersive world of virtual reality games. It is based on a review of published literature and two focus groups, one with adolescents and the other with parents. The literature review recounts how introduction of a new technology has engendered fear and suspicion throughout history and digital technology too has its supporters and detractors. Where technology enthusiasts see affordances, new extensions and egalitarian access for greater human interaction the critics are perturbed by loss of real life encounters, individualism, online addiction, cybercrime and physical atrophy. A generation of footloose teenagers has grown up surrounded by communication technologies. They hardly indulge in socialisation on street corners, outside schools and in play grounds. In Pakistan there has been barely any attention to research in this critical area of social change. The small interview sample reported by Anika corroborates the ambivalence about the impact of virtual technologies observed in the literature from the west and the upper classes in Pakistan. The less overt refrain in the interviews and literature about loss of physical activity, dishabituation of environment and powerful external influence is too significant to be ignored. There is a feeling of helplessness among the people as the upbringing of their children is fast passing out of their hands.

Thousands year old subsistence agriculture in Hunza-Nagar has gradually changed to a market oriented industrial agriculture since 1980s with major social implications. **Michael Spies** presents a case study of the remote village of Minapin in Gilgit Baltistan and unfolds the complexity of farming dynamics in this high altitude locale. Taking actor-network theory as his framework he conceptualizes the place and its productive processes as a complex and dynamic 'assemblage' of diverse social and natural, material and immaterial, small-scale and large-scale, and local and external components. With this bottom-up approach rather than a top-down perspective, he begins with empirical observations on the ground, and then investigates their sometimes very unexpected relations to other elements and processes of the socio-natural environment. He concludes not one but multiple actants together were responsible for the change, including NGOs, markets, individuals, education, and physical infrastructure. While the role of each cannot be denied but did all these independent actants appear spontaneously or are they all imperceptibly connected through the web of the market?

Amna Tanveer Yazdani and Nosheen Ali present a spirited and compelling narrative of the 'nature of seed' farmed in Pakistan through the case of the new

legislation as exemplified in the Plant Breeder Rights Act 2016 and the Seed (Amendment) Act 2015. They tell the history of the making of seeds, from the long struggle of autonomous farmers of south Asia for raising the best varieties for yield and product quality to the more recent shift to a dependence on seed corporations and related monetized economy. Eons of unity of seed and production of subsistence agriculture has been sundered in this process. The new legal regime being foisted on the agricultural sector is embedded within this history. The relatively recent regime of industrial agriculture had its roots in colonial capitalist extraction and loss of local social control over production. The side effects of new technologies courtesy the 'green' and 'gene' revolutions start manifesting right in the process of production as they do in the final product too. The sales point of agricultural technologies is productivity. Fertilizer, pesticides have been followed by biotechnology in the fields of meat and milk.

The last to enter is the genetically modified (GM) seed that claims productivity benefits for those who adopt it by being resistant against herbicides, pests and drought. Indeed if it does carry all those benefits sooner or later farmers would adopt it anyway. Then why is the new seed legislation laid like a trap, when those who enter cannot leave. Perhaps because those who have laid this trap know well that all those who enter will try their best to leave and they must close all doors to escape. Farming with GM seed requires intensive use of fertilizer, pesticides and water. It is an investment farmers must make for every crop. Small farmers cannot fulfill all requirements. If and when their crop fails they get into a debt trap. If anyone wishes to see the trap of 'high productivity' GM seed, he should look east towards India where hundreds of thousands of farmers struggle to leave and when they cannot they commit suicide. The overview of legal and policy history reveals bias for the powerful at the expense of the rights of small-scale farmers and farm workers. Along with the socially skewed nature of these policies there is disregard for the long term ecological health and bio-diversity. The observed inclination of the legislation is clearly towards corporate-controlled agriculture and a low priority of pro-farmer policies. The authors situate the case of Pakistan within the larger international developmental outlook and link it to the growing threats to food sovereignty for states such as Pakistan. European Union member states on the other hand enforce strict guidelines and a legal framework for minimizing threats to their agricultural ecologies. Europeans have been extremely cautious and skeptical of corporations under pressure from an informed public. Their legal measures ensure responsible and safe authorization of GMOs, high-standard safety assessments, risk assessment, clear labelling of GMOs to enable informed consumer choice and the traceability of GMOs placed on the market. Pakistan on the other hand has thrown its doors wide open to profit relishing corporations without well-developed safeguards in place.

Rabia Ezdi toured the Chitral valleys to study the role of historical vernacular architecture in providing protection after the October 2015 earthquake disaster. Her observations highlight the role of vernacular building tradition that has evolved using local materials and traditional knowledge and the contemporary political ecology which is forging new building practices. In the vernacular architecture of Chitral resilience against earthquakes was based on the use of wood, especially *diyar*

(cedrus deodara) in building construction which ensured tensile strength to erstwhile dry stone masonry and mud construction. In modern times beginning with the colonial administration, the Chitral forests have come under state regulation and rights of the locals to the *diyar* of indigenous forests were embedded in legal Acts. Today the system of timber permits for use of wood by locals has been defeated by the force of market. The increase in demand down country and the communication revolution has led to high price for *diyar* wood and made the timber traders into powerful mafias. Moreover the locals have developed a taste for urban lifestyles and hence a greater dependence on cash. The aspiration of the wealthier villagers for perceived advanced amenities and modern homes have set in the trend of building with industrial materials such as cement concrete, steel and galvanized iron sheets. In this new ecology, the highly appropriate local construction which had seismic resilience, thermal comfort and affordability has been lost. The disappearance of *diyar* in construction is tied not only to deforestation but an emerging new political ecology. It is not the old ecology built around nature, it is a new ecology building around market. In this environment there is loss of local skilled craftsmen, influx of new materials, lifestyle aspirations, greed of timber mafias, corruption of state functionaries and above all the powerful takeover by the market.

Tariq Abdullah takes up the case of biases within climate science. It is a dissection of the social nature of 'scientific' discourse and claims and the social reality of a world dominated by capitalist production. Unorthodox in its format it poses a series of simple questions and in response unfolds the limits and biases of science particularly the science of climate change. He demonstrates how this science of climate as represented by Global Circulation Models (GCMs) and global institutions such as the International Panel on Climate Change (IPCC) are products of a particular social and historical context. GCMs have become the basis for climate policy but they too have a genealogy, these super computer models are works in progress and like all scientific inquiry rely on certain simplifications and can never be complete and categorical. They have allowed significant insight into climate change but have also left unaddressed many complex issues particularly the political and social aspects of climate change. Surplus extraction, energy intensive production, wasteful consumption and accumulating capital and political power are part and parcel of climate policy but hardly addressed in the scientific discourse. The production of nature concept recognizes the socially entangled and embedded nature of scientific knowledge. The capitalist paradigm on the other hand creates binaries: socially, between the individual and society and in the realm of science between facts and values. Critical investigation is a struggle against the reductive approach of capitalist science, it is historically informed and politically defined as much as it is empirical and positivist.

The papers, about the experiment of English as MoI, use of digital technology by adolescents, changing agricultural practices in Gilgit-Baltistan, new seed legislation, transformation of vernacular building practices in Chitral and biases in climate science are revealing of the increasingly contradictory and disruptive character of many processes in the 'production of nature'. The powerful imperatives of a globalized economy wrench the project of education from local tradition and history

and to make it a secular instrument for training, divorced of critical thought and social integration. Market competition drives the constant enhancement of digital products but disregards the social and health outcomes of immersion in virtual entertainment. Infrastructure facilitates transfer and extraction for monetary gains but also serves the spread of monocultures farther into the landscape. Legislation is used to protect powerful market interests and help in the enclosure of commons ignoring ecological destruction and food sovereignty of communities. Science too is sacrificed at the altar of the market as climate change science is divorced from the politics of climate justice. The project of 'development' clearly discounts the 'unsustainable nature' of our present social condition.

Rabia Nadir

SOHA BASHIR AND FIZZA BATOOL

ENGLISH AS MEDIUM OF INSTRUCTION IN PUNJAB: THE 2009 EXPERIMENT

Abstract

English has existed as the medium of instruction in some private schools of the subcontinent for over a century now. However, the sudden enforcement of English as the medium of instruction in the government schools of Punjab led to such a notable deterioration of the educational environment that the government had to abandon its forcible implementations without even issuing a notification of withdrawal. In the four years of its implementation, 2009-2013, students' cognition of subjects drastically dropped, cramming increased, student teacher relationship declined and their confidence suffered. A number of studies on the failure of this policy have blamed a lack of capacity, competence and due diligence on the part of government school teachers. This study of 30 government schools of Lahore traces the issue of MoI historically and reaches different conclusions. Teachers are definitely nor the culprits, if anything, they are the victims of an ill conceived government policy. We found most teachers dedicated, committed and involved. They considered the government policy flawed, based on wrong advice and which, contrary to its claims, would only deepen the inequality of the educational process further and deprive their mostly working class students of whatever little education they were able to receive at present. Spread of private education and gradual withdrawal of government from school education has completed the process of differentiation leaving only the poorest attending the government schools. The social class and home environment of these students is far removed from the environment conducive to learning English.

Linguistic landscape in Pakistan

Partition of Indian subcontinent by British colonizers in 1947 gave birth to Pakistan, a multilingual and multiethnic country. Initially it had 5 provinces, four in the west and one, Bengal, in the east. In 1956 the four western provinces were merged to create West Pakistan, Bengal was renamed as East Pakistan. These two regions were separated by more than 1000 miles of Indian territory. In East Pakistan (now Bangladesh) Bangla was the language of 98 per cent of the population. Whereas, West Pakistan (now Pakistan) comprised many different ethnic groups, with a number of major languages like Punjabi, Sindhi, Pashto, Saraiki, Hindko, Balochi, and many distinct smaller languages like Brahwi, Makarani, Shina, Wakhi, Chitrali, Balti etc. and numerous dialects. The country is linguistically extremely diverse, as is evident from the Summer Institute of Linguistics claim that there are 72 languages (Lewis 2009) whereas Rahman (2010) believes there are 61. Punjabi together with Saraiki is the mother tongue of nearly 55 per cent population or some 100 million people, Sindhi of some 15.42 per cent, Pushto of some 14.1 per cent, Balochi of some 3.57 per cent

and Urdu of 7.57 per cent people (GoP 1998)[1]. Urdu, now the lingua franca is the national language of Pakistan which is the mother tongue of less than 8 per cent[2] of the population, and is extensively used in urban areas. English perforce continued to be the official language and is used in 'domains of power' such as judiciary, military, education, media and administration (Rahman 1996).

Ever since its creation Pakistan has faced much difficulty in choosing the right medium of education policy and like many other post-colonial countries met with the problem of language policy and planning especially in the education sector (Mansoor, 2004; Mustafa, 2011; Rahman, 1996; Rassool & Mansoor, 2007). The erratic attitude of the government is visible in the fact that since 1947, it has issued at least 22 major reports and policy documents on language-in-education policies (Rahman 2004). However, Mustafa (2011:47) argues, "education authorities are shirking their responsibility of taking a categorical decision on this issue," and advocates that the language policy needs to be "formulated clearly and pragmatically".

Although English had long been the medium of instruction in the private schools of Punjab the government schools continued to use Urdu. In 2009 a directive of the government of Punjab suddenly imposed English as MoI in 56000 government schools. This paper argues that the 2009 English as medium of instruction (EMoI) policy of the Punjab Government, which professedly aimed at creating better opportunities, white collar jobs, higher salaries and social equality (NEP 2009; GoPb 2009; GoPb 2009a), in fact further marginalizes the poor children enrolled in government schools. They end up tremendously disadvantaged by becoming alienated to local language, education and their own environment. The gap between rich and the poor only deepens through such policy and weakens the government schools further. This paper attempts to understand the implications of policy of English Medium of Instruction on student's cognition and their learning environment.

Using language to concentrate privilege: The two stream education

What was the state of education in Punjab in pre-British days? GW Leitner, a renowned educationist and linguist of the period, who in 1865 was appointed the first principal of the Government College, Lahore, carried out an extensive survey of indigenous community schools in Punjab, in the decades after annexation in 1849. Leitner reports a more widespread literacy in pre-British days and his book, History of Indigenous Education in the Punjab published in 1882, gives a detailed account of different kinds of schools. He writes, "In the very year of annexation, 1849, Sir John and Sir Henry Lawrence were able to declare that there was one school to every 1783 inhabitants in the most backward of the three divisions of Punjab, before the British government had expended anything on education, whilst in the most advanced, there was one school to every 1441 inhabitants". The indigenous schools imparted instructions to Muslims, Hindus and Sikhs in Arabic, Sanskrit and Gurmukhi respectively as well as in Persian. The Persian medium schools were open to all. Leitner reports that in the 1840s at least 330000 pupils were enrolled in the schools who could read, write and carry out basic arithmetic while thousands more were

enrolled in Arabic and Sanskrit colleges attaining mastery over oriental literature and law, logic, philosophy and medicine. The curriculum was both advanced and sophisticated (Sultan 2011).

The British policy for other regions of India had been to use English as the official language but use the local vernacular for the lower bureaucracy (Mir 2010). They adopted the same policy for the medium of instruction (MoI). The schools and colleges for the chiefs, and the missionary schools could use English as the medium of instruction while those for the masses used the local vernacular. When British annexed Punjab Urdu was not the medium of instruction. It wasn't even the official language and it was certainty not the vernacular. Yet, Urdu not Punjabi was adopted as the MoI in schools and as the official language for the lower bureaucracy (Mir 2010).

The background to this decision has been researched at length by Farina Mir (2010), "Given colonial understandings of Punjabi as the language of Sikhs, [Company] officials feared that adopting it as the official provincial language might promote Sikh political claims …. The insecurity is evident in November 1849 report by Charles Napier, commander-in-chief of Company forces, when he said, 'The Punjab has been occupied by our troops but it is not conquered. We now occupy it with 54000 fighting men and it is at present very dangerous ground ….' These fears bore directly on the language policy implemented by the Company state. To institute Punjabi as the state language would have encouraged Sikh political aspirations. [To justify that policy] Colonial officials raised doubts that Punjabi was capable of serving as an administrative language …. [but] Such sentiments about Indian vernacular languages had been voiced in other contexts as well. In the Bengal Presidency, colonial officials had earlier made remarkably similar comments about Bengali, Oriya and Hindustani … [That] They were uncouth, barren, and unadapted to the conduct of judicial proceedings …. Despite these, misgivings all three languages, Bengali, Oriya and Hindustani – were adopted for use in the Bengal Presidency…." For the British the overriding consideration was political control of the colony and not the education and literacy of the masses. Punjabis thus, were deprived of their mother tongue as medium of instruction.

This decision was taken despite efforts by educationists to give precedence to Punjabi (Leitner 1882). It was of major political significance because it removed the glue of the society and helped deepen the class divide replacing tribal and baradari affiliations with class. Gradually the divide was deepened by one step further and the scions of the top elite, the rajas and the chiefs, were given a taste of English at few selected schools like the Lahore's Chiefs College while the missionary schools were allowed to cater to a section of the urban middle class. The British are generally believed to have promoted education in the subcontinent but their policies against the local vernaculars especially in the Punjab, closed down the widespread network of community schools. The primary motive behind establishing such English schools was not to promote literacy, education and science but to strengthen ties with the upper classes who were needed for administrative, bureaucratic and military services as well as for political legitimacy. Such intents were first expressed by Lord Macaulay in his address (Macaulay's Minute) to British Parliament in 1835. He had been sent to India to design

an appropriate education system for the British Raj and he was the Chair of the Committee of Public Instruction. In his Minute Macaulay strongly argues against any plan to educate locals in their native languages. He said, "All parties seem to be agreed on one point, that the dialects commonly spoken among the natives of this part of India contain neither literary nor scientific information … It seems to be admitted on all sides, that the intellectual improvement of those classes of the people who have the means to pursue higher studies can at present be affected only by means of some language not vernacular amongst them….."

Macaulay continues, "We must at present do our best to form a class who may be interpreters between us and millions whom we govern-a class of persons Indian in blood and colour but English in tastes, in opinions, in morals and in intellect. To that class we may leave it to refine the vernacular dialects of the country…."

The same view was later echoed in the assertion of Lord Curzon, the Viceroy of India (1898-1905) who said ….

"…the young chiefs (who were supposed to learn the English language and become sufficiently familiar with English customs, literature, science, mode of thought, standards of truth and honour) would be allies of the British." (Raleigh 1906).

The widespread pre-British network of indigenous schools that Leitner (1882) found in Punjab, William Adam found in Bengal, a province which was occupied much earlier than Punjab. In his reports on vernacular education in Bengal and Behar (Adam 1868) Adam found that on the eve of British occupation a widespread self-sustained local network of indigenous schools existed in rural Bengal where literacy and practical education suited to the needs of the society was delivered. It was gradually and systematically stifled and marginalized after the takeover by the British with an imposition of tax on exempted lands leading to bankruptcy of many zamindars. This together with closure of local industrial crafts removed the support base of rural education (Long 1868). By the year 1877 the number of pupils had fallen to one in 688 instead of 2.5 to 100, 40 years before (Basu 1941).

Based on different sources including Adam (1841) and Leitner (1882) Di Bona (1981) reports, "Macaulay's famous minute of 1835 established English as the official government school policy which concentrated on higher education …. throughout India this meant the use of available funds for colleges teaching in the English Language to the neglect of other educational institutions. By 1854 the Woods Dispatch called for the use of educational credentials for jobs with the colonial government, and this was the death knell for the indigenous system …. As the indigenous system schools disappeared, the English schools did not take their place. It was as if an elephant had departed and a flea appeared instead" (Di Bona 1981).

The British realized rather early that it was neither possible nor desirable to teach English to the common man so they adopted English as a subject in the middle and senior high school and made compulsory for a matriculation certificate in class 10th.

The largest number of pupils failed in English. While discussing teaching, Leitner noted the prevailing method of teaching caused pupils to memorize esoteric facts and to repeat sentences of whose meaning they were completely unaware subjecting them to "the tyranny of cram." He also quotes an instance where he had to look over 50 papers in English prose where none of the answers to the question were correct (Sultan 2011:72).

Since then the policy has promoted a deep cleavage in education and social position. In the words of GoP White Paper (Aly 2007:53) for making National Education Policy, "It [English] was imposed as language of the rulers during the British rule and was also pursued because Indians aspiring to improve their social status and their economic condition tried to cultivate themselves in the English language to benefit from English patronage and recognition and simultaneously to share the measly bits spared for them in the corridors of power."

The Hindu elite was quick to adopt it but the Muslim feudals also received the message and sent their scions to local elite institutions as well as to Britain. Many trained themselves to speak and write impeccable English. The British thus left a deeply ingrained legacy before they departed.

The British adopted English for higher levels of official communication but local vernacular for lower level official work. Correspondingly, English was chosen as the MoI at the elite institutions while that for the mass education lower down remained the local vernaculars such as Bengali, Urdu and Hindi. Thus English became the language of power to the neglect of local languages.

In Pakistan since before independence institutions of higher education had been imparting science and technology education in English. All professional education at engineering and medical colleges was also imparted in English. There is no alternative it was said then, as today, because English is the language of science and technology which have evolved in that language (GoPb 2009). This rationale of the relation between science and English was bought and accepted by the common man driving a nail in his own coffin.

English has been entrenched and ingrained in the society by attaching privileged class position with it. The Central Superior Services require an impeccable knowledge of written and spoken English. These services are said to be merit based; the poor too, could compete to become privileged. The possibility of joining professional and superior services was a big invitation to enter the race for acquiring English.

The English medium of instruction at the elite schools continued after the departure of the British and the local elite has been able to use their English proficiency to maintain the hold of their class on the institution of governance. According to Curle (1966), "…goal of Pakistani society was not change, but stability. Education was not thought of as a means of promoting democracy, or spreading egalitarianism, or increasing social mobility. On the contrary, its role was to maintain the status quo".

The policies of elite schools are programmed to "better serve the rich and provide knowledge that ensures easy access for their children to the higher echelons of society" (Khattak 2014).

Since after the creation of Pakistan, English has been associated with the ruling elite and as the gateway to power and domination. From 1947 till 1971 policies of two stream education continued with the same aim to create two classes of people, dominant and the dominated. In 1972 Zulfiqar Ali Bhutto came into power, soon after, all schools were nationalized. The constitution of 1973 decreed replacement of English by Urdu as the official language of Pakistan. Along with that it also recognized the rights of speakers of regional and minority languages by allowing the provincial governments freedom to develop their languages. Realizing the failure of the state to adopt Urdu as the official national language since the creation of the country, the 1973 Constitution reiterated and adopted a fifteen year limit to do the same. In 1979 some institutions like Muqtadarra Urdu Zaban (Urdu Language Authority) and Urdu University were created to fulfill the requirements. However, after much posturing little real progress was made.[3]

Globalization and the new education policy 2009

In the meanwhile, bigger changes at the global level made the issue of making Urdu the official national language almost irrelevant. Globalization and the creation of an Anglo-Saxon superstate led to loss of sovereignty and abandonment of policy-making at the national level. Having admitted that English was imposed by the British to consolidate colonial rule Government of Pakistan (GoP) White Paper 2007 continued that English was now considered a language of international communication, cosmopolitan life and international trade and commerce in other words an international necessity in the globalized world.

Thus the sudden imposition of English as the MoI in Punjab's Urdu medium public schools in 2009 was not so sudden after all, it had been long in the making, only post-World War II nationalism had been an embarrassing hindrance. The globalization surge had finally removed that; there could not have been a more opportune moment. Globalization and the resulting loss of livelihoods has resulted in a diaspora. Since the 1980s people's imagination has gradually shifted from the project to change Pakistan to the project of leaving Pakistan and to facilitate the project to leave Pakistan English has become a desired objective.

Globalization and the global spread of English have created a phenomenal demand for the mastery of English around the world. In fact, Hamid (2011) notes that discourses connecting globalization, English and development have led developing nations to enhance their commitment to English. In Pakistan, this commitment was reflected in the form of National Education Policy and English as medium of instruction in government schools of Punjab in 2009 (Coleman 2010). The goal of the policy was that students from poorer backgrounds should learn English and join competition in the globalized world in the field of knowledge (Dearden 2014).

As mentioned above in March 2009, the Government of Punjab (GoPb 2009) announced a move to introduce English Medium of Instruction (EMoI) in public schools starting from Grade 1 (British Council 2013). No wonder, lower class parents of the Urdu medium government schools were enthusiastic and receptive of this change. This policy change was supported by the Punjab's Schools Reform Roadmap, launched in April 2011, with the help of DFID (Department for International Development of the UK) and the British Council which envisaged major improvements in both access to school and the quality of instruction.

Below we give quotes from two letters and related documents issued by the Government of Punjab ordaining the change in the Medium of Instruction (MoI) in government schools to English and the summary of the rationale of the policy given therein:

The Government of Punjab vide its letter No.PS/SSE/MISC/2009/67, dated March 28, 2009 announced conversion of selected government schools into English medium from Ist April 2009 in each district. The announcement said,

"The general public has to face exploitation by a large number of private schools in the name of English medium of instruction. The situation can only be checked if government schools provide a reliable alternate. Additionally this has also adversely affected the enrolment in Govt schools. Parents of even lower middle class and poor segments of society are being attracted by private schools due to English medium instruction, smart uniforms and computer literacy. As a result the Govt schools are losing talented students.

As compared to private schools the Government staff is more talented, qualified and trained with better salary and job security. The successful experiment of one English medium section in selected schools has shown excellent results, and proved the potential of Government schools for effective English medium instruction.

With a view to provide suitable alternate it has been decided from 1st April 2009, the subjects of Science and Mathematics will be taught in English from class 6, in some of the selected high/higher secondary schools. The selected high schools with primary portion will introduce this system from the classes of Nursery, 1 and 2 as well. The remaining classes from 7th to 10th may be kept in Urdu medium. Gradually these schools will be changed into English medium in a period of 4 years."

The Government of Punjab School Education Department again issued another letter No.PS/SSE/MISC/2009/176, dated 1st September 2009 titled "Conversion of Government Schools into English medium schools from 1st April 2010". It said, "The National Scheme of Studies requires that the subjects of Science and Mathematics will be taught in English in each school. The Government of the Punjab is implementing this policy in a phased manner. In first phase 588 High Schools and 1103 Government Community Model Girls Primary School were converted into English Medium Schools. In second phase 1176 more High and Higher Secondary Schools (double than the previous figure) will be converted into English Medium

from 1st April 2010. The total number of selected High and HS Schools will become 1764. Finally all remaining Govt. Schools from Primary to higher Secondary will start teaching of Science and Mathematics in English from 1st April 2011"...... "The English Medium Schools will conduct morning assembly in English for the first three days of the week. The English Medium School will include the word "English Medium" in their names written on main gate and other places. They will also publicize that the school has computer education facility".

The letter carried with it an explanatory note and regulations in the Urdu language. In the explanatory note the government justified the introduction of English Medium of Instruction inter alia as follows:

"It is an established fact that a class divide plays an important role in education destroying the unity of thought in the nation. It is therefore that the Government of Punjab has decided to end the class divide in education. In order to achieve this object whereas the Government has decided to introduce uniform examination system for class 5 and for class 8, it has also decided to introduce uniform medium of instruction [for all schools] … this uniform medium [for] a particular subject shall be decided on the axiom that a subject is best taught in the language in which that knowledge has been generated. The knowledge of English, math and science exists in the English language and is being generated in the same. Therefore, the Government of Punjab has ordained English language for the teaching of this subject in the English medium schools."

In terms of research in school education major systemic concerns in the past thirty years have included: students attendance, teacher absenteeism, students enrolment, missing infrastructure, students evaluation, expansion of private schools, teacher's training and evaluation, gender disparity, (Andrabi et al. 2005, Andrabi et al. 2007, Andrabi et al. 2008, Barber 2013), teacher's assessment of teaching English (Shamim 1993, 2008), their English language skills (Davies & Khalid. 2012, British Council 2013, Rashid et al. 2013) and spotty enactment of policy (Shamim 2008, Mustafa 2011). Manan et al. (2015), argue "English language teaching and English-medium policy particularly within different schools cannot be analyzed without taking into account the broader sociopolitical and socioeconomic scenario and while analyzing English-medium policy in schools, researchers need to address the educational, cultural, psychological and ecological concerns". There is a need to examine the consequences of English-medium education for children in Pakistan as there are relatively few empirical studies of classroom discourse and its effects on learning in Pakistan (Shamim 2008). There are even fewer studies on the quality of education in the low fee private schools (Manan et al. 2015).

Impact analysis of English medium of instruction (EMI)

As noted above over the past 30 years a lot of effort both by government and the NGOs has been devoted to measuring the achievement, targets and evaluation of students in the ability to read, spell, know mathematical logarithms, monitoring teachers attendance, qualification, gender disparity (Andrabi et al. 2005, 2007, 2008,

Barber 2013) enrolment, and on physical infrastructure. However, as the 2009 policy to change the MoI to English with assistance from DFID and the British Council with backing and thrust of the state over and above the heads of school teachers was already running into sand by 2012 and by 2013 its failure was the subject of many studies. These related to English language skills (Davies and Khalid 2012, British Council 2013, SAHE 2013), assessment of teaching English, spotty enactment of policy (Mustafa 2011). Most of these studies did not criticize the policy itself but the methodology of implementation and the teachers who were tasked with its implementation. The more fundamental and philosophical aspects of education were not counted. The issues of the medium of instruction, the content of the courses, the social class of the public school student, the nutritional state of the students, the student teacher relationship, the pedagogy of teaching and the conditions in the low fee private English medium schools were hardly investigated (Manan et al. 2015, 2016). However, with the enactment and failure of the MoI policy 2009 the issue of the MoI, as an unintended consequence has generated much controversy and debate lending the language issue for deeper examination. It was due to such a sudden and drastic shift to a foreign medium that attention was directed to the fundamental issues of education and language neglected and that had never had primary in local discourse.

Starting 2012 many reports and investigations started to appear on the failure of the policy to adopt English medium of instruction in the government schools. Saeed et al. (2012), studied the impact and problems of English medium of instruction (EMI) on students at secondary level in Punjab schools. The study gathered quantitative data on perception of 85 teachers from 17 schools. The data is very clear in establishing that introduction of EMI for the subjects of science and mathematics is sheer disaster, 76 per cent students don't understand lessons when explained in English. Nearly 70 per cent teachers conclude both math and science are better explained and better understood in Urdu.

Society for Advancement of Education (SAHE) also conducted a study in public schools of Punjab in order to assess the impact of the introduction of English Medium of Instruction on students and concluded that school teachers were not competent to teach and their English competence is a major concern, notably in Maths and Science lessons (Rashid et al. 2013). They also indicated that more than 50 per cent teachers and head teachers do not endorse the policy.   The report argues that using English may not support change and improve quality of teaching and learning in the absence of competent English teachers. Moreover, it suggests that English should be taught as a subject rather than the medium of instruction at least till Grade 5.

In 2013 British Council conducted a study to assess the English medium policy (EMI) in Schools of Punjab. They tested 2008 primary and middle school teachers in 18 districts of Punjab. They concluded "62 per cent of private school teachers and 56 per cent of government school teachers lacked even the basic knowledge of English including ability to understand and use everyday simple phrases. Most of the remaining teachers received scores that placed them in the beginner's level. Even in English medium private schools, 44 per cent teachers scored in the bottom Aptis[4] band".

Interestingly, about the same time as in Pakistan, English was made the MoI in a number of other Third World countries.

Pearson (2013) in an ethnographic study analyzed the 2009 shift to English as MoI in Rwanda. However, the policy failed and reversion to the previous policy of conducting first phase of primary education in the local language Kinyarwanda was reintroduced. The teachers reported, they were neither consulted nor prepared before the policy was abruptly enforced in 2009. It goes to show the MoI policy shift is not a local or indigenous decision, it is a global enforcement.

Similarly, Mulumbaa and Masaazia (2013) wrote on the impact of adopting English as the MoI in Uganda's schools. In an in depth study of middle and senior high students of two government schools, they established that the foreign (English) medium of instruction in Uganda's secondary schools was an impediment to the attainment of knowledge and skills among students. This was because the students were instructed in a language they had not mastered and they struggled to learn both the medium and the content being taught. The students were uncomfortable in the foreign medium and when they could not grasp the meaning of a concept then cramming became the only alternative and subsequently they found themselves unable to apply what had been taught or relate the concept to their daily life. Likewise, in the exams students produced their classroom notes word by word and failed any question that required application of the subject matter.

Mohamed (2013), in his work discussed, languages used in Maldives schools and the impact of adopting English as the MoI, from the time children begin preschool. The country utilizes a second language as the MOI for the school curriculum because of the great need it sees for its people to be connected to the rest of the world. However, as a result of this policy, the local language of the country, and people's attitudes to it, seem to have been affected. From an educational perspective this policy was hindering academic achievement. It was suggested that there was an urgent need to reform the language policy to promote students' linguistic diversity and enhance academic achievement.

Bhattacharya (2013) explored "different literacy practices influencing the negotiation of the medium of instruction, its impact on language learning and wider language policy and planning implications. It revealed that 'English-medium' instruction in a typical small, private Indian school catering to poor children leads to restricted acquisition of English, in ways that also constrain students' ability to access educational content across subject areas. Thus, poor children who enroll in these schools in increasing numbers precisely because of the schools' self-identification as English-medium institutions, end up doubly disadvantaged, because they are cut off from both language and content".

Modi (2015) has quoted evidence from various parts of India to show that even star students studying in English medium state schools and getting 80 per cent marks, do not write or express themselves in correct English. Likewise teachers who have done

their masters and the requisite degrees in education have the same problem of expression in English. The author also mentioned in earlier year (2015) "the Indian Punjab state education minister was shocked to discover that a significant number of English teachers in the state had very rudimentary English skills even though many of them had postgraduate qualification in English language or English literature. The state government, suddenly conscious of the English deficit, is trying to fix the problem with short in-service training programmes conducted by the British Council or by the Corporate Social Responsibility (CSR) divisions of business corporations. The average private school is generally worse off because private schools have lower qualification requirements and less experienced teachers".

While introducing English in both Pakistan and India the mantra was the country had an English language advantage from colonial days that could make it a leading knowledge economy, it would close the skills gap and offer global employment opportunities. This simple minded link between English language, jobs and social mobility has won over large swathes of population who are fast liquidating their long preserved assets into cash for fees. Across the world, and in India, there is a consensus among educators, educationists and linguists that children learn most effectively in their mother tongue. Research collated by UNESCO shows that "children who begin their education in their mother tongue make a better start, and continue to perform better, than those for whom school starts with a new language". Besides many teachers barely know the language of instruction.

The claim that "we need English as the language of technological development" is often heard. The claim is repeated several times in National Education Policy, 2009. Yet the claim seems unfounded. As Rugemalira (1990) maintain: "It should be demonstrated that countries such as Finland, Norway, China or Japan, which do not teach their children through the medium of an "international language" are isolated and have lost track of technological developments beyond their borders.

A 2004 feature by V.K. Nanayakkara ex-education secretary and secretary to the Prime Minister of Sri Lanka wrote about an interesting experiment conducted by Sri Lanka in the reverse direction. We think it would be useful to discuss this at length. In 1945 Sri Lanka decided to replace the English medium of instruction in all its state and private schools gradually from the primary level until even the faculty of Arts of the University of Ceylon changed the medium of instruction to Sinhala and Tamil in 1960. Only the Dutch and Portugese Burghers and Muslims were permitted English medium education which too was withdrawn in 1971. However, in the words of Nanayakkara

"After a period of relative acceptance of monolingual education in the mother tongue, a number of factors conspired to swing the pendulum back towards a re-enthronement of English. By the 1990s cracks began to appear in the postwar consensus on 'mother tongue only education'. Gradually the government of Sri Lanka reintroduced English starting in selected schools and later as an option for selective subjects in the new medium." Nanayakkara then poses a question and answer it, "Was the switch-over of the medium of instruction to Sinhala and Tamil a retrogressive

step? Was it a mistake of history? We do not think so, in the circumstances that prevailed then. While English remained the exclusive domain of the elites in Sri Lanka, the transition to national languages was an essential step. Mass education was made possible by this change".

Ranaweera (1976), writes about the great advantages to the population of Sri Lanka on the introduction of Sinhala and Tamil as the languages of instruction to replace English—especially for the teaching of science and technology: The change of MoI from English to Sinhala and Tamil helped the masses science and destroyed a great barrier between classes and built their confidence as well. Ranaweera argued for the greatest need to switch over to the national languages in the science subjects and believed that English medium was a great constraint which hindered the expansion of science education.

Methodology

This paper is not a quantitative survey on what the various stake holders in school education have to say. It is not even an assessment of the levels achieved by the students or the competence of the teachers to teach contents at the relevant levels. It is not even the English proficiency test of the teachers expected to teach in English nor about the number of pauses teachers make while teaching in English. It is about the role of language in determining the complex environment of learning which among many other things inspires or discourages the student, imbibes him with confidence and identity develops a relation with the teacher, involves or cuts off parents from the process of his education, and enables him to learn from the real world around him and the real people in the community.

The truth of Vygotsky's sociocultural theory has gradually come to be established among educationists Vygotsky argues that development of human cognition and higher mental faculties develops from social interaction and participation in social activities which deal with cognitive and communicative functions in ways that cultivate and scaffold them [intelligence].

In Pakistan most of the research based on Medium of Instruction focuses mainly on studying the situation statistically. Whereas our focus was to pursue a grounded study. In the words of Merriam (2002) *"Qualitative research is like a living survey with an emerging design"*.

Considering that there is more in the field than meets the eye which can only be explored through experience and interaction, we chose the qualitative approach for its detailed method of seeking an elaborate on-site meaning of the impact brought by the change in medium of instruction on the learning environment of the students. It is a grounded research.

Different Primary, Middle and High schools were visited to measure the change at specific grade levels. In-depth interviews and focus group discussions were conducted

with subject and head teachers from 30 different government schools. Head teachers were mainly questioned about their opinion on the policy change and its advantages and / or disadvantage. Interviews with teachers and subject teachers were more detailed about their observation and experience related to the change, implications and impacts of the policy as well as on the learning outcomes and results of students as compared to previous years. No specific subject category was made. Science and Math teachers described the effect on pupils' cognition with the change in the medium of instruction to English. We also included Urdu teachers in our interviews to check the effects on Urdu as a language.

Some interviews, as per requirements of the study, were done with different stakeholders other than teachers like head teachers, policy makers, and education committee members. These interviews were all recorded and transcribed, field notes were constantly made throughout the process.

We followed a variety of settings for the focus group discussions but most of the teachers were well acquainted with one another, which allowed them to open up easily. The sole purpose of these discussions was to provide the teachers a platform where they felt at ease to share their opinions about the policy change and how, under their observation, it had made its impact on the results of students. Meanwhile, student profiles were also made to keep a record of their socio-economic backgrounds.

Investigation and Results

Below we report the results in the form of raw data as well as a summary of response and observations.

An unpredictable policy

In-depth interviews and focus group discussions revealed teacher perceptions of the 2009 MoI policy. Participants routinely described the nature of policy as sudden, top-down and causing serious disruption to the environment of learning. Shamim (2008) argues that language education policy decisions are driven mainly by global forces. Education reform in Punjab has been driven by the provincial government under the Chief Minister and with the support of donors including DFID and the World Bank (British Council 2013). In literature, the policy has been described as 'top-down' by policy makers and education managers rather than through consultation with the key stakeholders (Dearden 2014). In general, teachers also alluded to the sudden, mandatory and 'top-down' nature of the policy. As one teacher said,

"Bgair koi ground bnaye ik dam se order ajatay hain. Koi soch bhi nahi sakta k hamari kitni khawari hui hai. Khud bhi unhain kuch pata nahi hota. Kabhi koi order ata hai, kabhi koi. Her cheez slowly implement honi chaiye. Achanak order nahi ana chaiye, pehlay sub ko mentally prepare karain. Teachers ko confidence main lain"

[They issue the orders without discussion. No one can imagine how terribly it upset us. Even they themselves (officers) know nothing. Any order can be issued anytime. Things should be implemented slowly. Orders should not be passed all of a sudden, everyone should be prepared beforehand and taken into confidence.]

The MOI in Government schools was changed overnight without informing the respective teachers beforehand or seeking their input. Teachers further reported that they got to know about the change of MoI when the course books were being distributed among the children and so the whole faculty was taken by surprise because that was the first time they opened them.

"Teachers ko kahin per naheen bulaya. Bus office main hi baat hui thi kay medium change ho chukka hai. Hmain btaya geya k hogeya hai"

[They didn't call teachers anywhere. We had a meeting in office where we were told that the medium of instruction had been changed. They just informed us that it had changed.]

"Dekhain aap Pakistan main rehti hain, teachers ko tou poochtay he nahi hain. Hmain baad main pata chalta hai ke ye ab apne kerna hai."

[Look, you live in Pakistan. Nobody cares for teachers. We only get to know post facto that we are supposed to do this or that]

The medium was changed without any discussion or debate at the public level or among the stakeholders. A few of the teachers when interviewed complained about not being foretold of the policy change. They hadn't been prepared or trained to conduct lessons in English.

"Jab government ne policy announce ki tou kisi ko consult nahi kia, ye itna sudden tha. Kuch teachers ko reference courses kerwaye. Teachers ker k atay thay phir parhatay thay"

[Government announced the policy without consulting anyone. That was very "abrupt" only few teachers were given reference courses first before they started to teach [in the new medium]].

Some teachers were even offended by the abrupt decision; they thought it wasn't fair on the part of the Government to make such an important change without discussing the matter at hand and not allowing the teachers to share their opinion. Even some English teachers did not have enough expertise in the language. They were upset that the Government did not ask their opinions nor arrange enough or any training programmes; instead a brand new medium was introduced to be a major part of our education system. Moreover it was an even bigger surprise for the students, who while being alien to the language, now had to study in it.

The policy was not just sudden, random and abrupt but it was also strictly compulsory. English Medium of Instruction was to be followed in all classes regardless of the expertise of teachers in the language itself. Most teachers found it uneasy to teach in English as they did not know the language themselves but the Government made it a point to be followed, ordering different punishments like stopping salary increments, etc. But such was the policy that with little or any training workshops, the staff was expected to meet the requirements of the new rule.

In the words of the teachers:

"Government ki taraf se hukum aya tha k English medium karo. Government nei forcibly kaha k English main parhana hai".

[An order came from the government to change the medium of instruction to English. The Government forcibly told us we had to teach in English.]

"Government ki taraf se ye order hain jin teacheroun ka result nahi acha un ko ye punishment ho tou wo punishment ho"

[These are Government orders that the teachers who aren't able to produce good results will face this or that punishment.]

"In the 15 days of our training courses we tried to adopt English way of speaking because we were said to deliver our lesson in English. Now the Government has made even the strict rules. If the result doesn't come out well for example of 3 or 5 or 6th the headmistress is not likely to get her increments and neither is the teacher. Due to which we have to do extra work and it becomes very difficult for the teachers to teach any subject in English as a lot of words given in the text are unknown and new even for me"

Medium of instruction; promotion of education and equity or propaganda against education…

The Government school teachers that we interacted with have been speculating about the reasons for change of the medium of instruction. They looked at it as a foreign motivated political move.

"Wesay mujhay tou lagta hai hmaray khilaf koi baqaida lobby kaam ker rahi hai jo kehti hai keh is mulk main is ke culture se related her cheez tehas nehas ker dain. Inn ka libbas apna na rahay, inn ki zaban apni naa rahay, koi culture or pehchan apni na rahay. Sub magrabi tarz per chal parain"

[By the way, I feel like there is a proper lobby which is working against us to make sure that everything in this country related to its culture should be wrecked and destroyed. They should lose their own dress, their own language; their own culture and identity nothing stays their own. Everyone should adopt western ways and lifestyle.]

Teachers view it as a hindrance in the development of country as most of them thought nations cannot progress and prosper with a language and culture that isn't their own.

"Koi aissa kamyab mulk nahi jis ne ghairoun ki zaban main taraqi ki. Tou ye tou propaganda huwa k science or technology k liye hum angraizi seekhain. Balkay ye tou science or technology k liye rukawat hai"

[No such successful country exists which developed by adopting a foreign language as its medium. This is merely a propaganda that to know science and technology, we need to learn English. It is in fact a hindrance in the way of science and technology.]

The only thing that binds people together, what makes them a strong nation is their shared set of values and beliefs. Taking that away from them and changing something as important and basic as their language means plucking them up from the roots. They said,

"Hmay uljhaya geya hai hakoomati satah per takay ye nazar he na mar sakain. In ko pagal rakho. European mulkoun ne yalgaar ki hai. Inn k dimag fail, inn ki jisam fail, inn ki khourak fail, inn ka ilm fail, inn ki her cheez fail kerdo. Jab hum attack kerain tou ye lagar paray houn. Mulk bhi hazir hai or hum bhi hazir hain".

[We are being entangled through the government so that we don't keep a watch. They want to turn us mad. It is an assault by European countries. They want to rob us of our minds, of our bodies, our diet, and our knowledge, everything; so that when they attack they find us defunct. We and our country both should be at their disposal.]

Rote learning in government's schools

This study revealed that rote learning was being promoted in schools that were investigated largely due to the use of a medium of instruction which was 'foreign' and alien to learners. Students were unable to grasp the meaning and concept so in that case cramming was the only alternative. In such circumstances, the students found themselves unable to apply what had been taught or relate the content to their daily life. Such content is only applied in examinations. The crammed work is reproduced in examinations without any added information or explanation. The findings further revealed that once examinations are done and passed, learners feel a sense of relief, and this marks the end to the incomprehensive topic or concepts.

An overall fall in results was observed which as the teachers explained was because the students were not catching up with the concepts in their English medium books, due to which they memorized everything for their exams, not actually knowing what is being discussed.

"Ratta increase hogeya hai. Concept jo hai wo zero hogeya hai or ratta raij hogeya hai. Or conceptual jo hai wo bilkul khatam hota jar aha hai. 9th or 10th main urdu medium ka ye faida tha k jub wo Fsc main jatay thay tou in k concept jo thay wo clear hotay thay. Beshak wo English parthy thay

per concept in k clear hotay thay. Ab ye hai k throughout English hai tou English se English wo in ko kerwanay ki koshish kertay hain per boht mushkil hota hai. Ratta ziada hogeya hai"

[Rote learning has increased. Understanding has fallen to nil and rote learning is ruling. The little conceptual learning that is left is diminishing with time. In 9th and 10th grade the benefit of Urdu medium was that when they got promoted to FSc. their concepts were clear. Even if they studied in English their concepts had become clear [in Urdu]. Now it is throughout English, so when we try to teach them just in English it gets difficult. Therefore cramming has increased.]

When the teachers were asked if the students are able to answer questions asked in English, they had the following to say:

"Ratti rattai cheez he btaye ga. Wo definition same wesay he btaye ga. Main energy parha rahi thi tou oos main likha tha "it is capability to do work" tou main ne koi das dafa repeat kia k "its ability of a body to do work" oos waqat bachoun ko samjh ai, yes ker rahi hain main ne example bhi dee. Aglay din mujhe nahi lagta k aik dou bachoun k ilawa kisi ne mujhay meri wording lotai ho. Wohee "capability to do work" jo book main, exact wohee".

[They just blab out what they have crammed. They tell the definitions as it is. I was teaching them the concept of energy. It was defined as "it is capability to do work" I repeated ten times that "it is the ability of a body to do work". At that time they understood it, and I also gave examples. The next day I don't think more than one or two students described it in my words. They were repeating "capability to do work" the exact words that were in the book.]

"Ratta system barh geya hai. Khass ker English medium main ap ye dekhain k aik bachay ko main circle theorem samjha raha tha. Kafi dair sar khapanay k bawajood ous ne apni he aik invention ker dee. Bilkul naya theorm bna diya. Her lafz per in ka ye haal hai".

[Rote learning has increased, especially in English medium. I tried hard to explain circle theorem to a child, he however understood it differently and changed it into a completely different theorem. They do it to every word {concept in English}].

"Bachoun k liye ab sirf ratta reh geya hai. Or wo bhi kamyab na hota agr itna objective na ata. Wo is sirf objective ne in ko par laga dia hai"

[Children are now left with the option of rote learning only. Even that wouldn't have been successful if an objective part hadn't been introduced. It is this objective part [of the exam] that has come to their rescue.]

"Bachoun main ab itni ability nahin hai k wo creative writing ker sakain. Concept tou Urdu main clear ho chukka hota hai. Know-how hoti hai k ye kia cheez hai. Laikin wo creative writing nahi ker saktay. In k pass vocabulary or sentence making nahi hai. Rattay main boht ziada izafa hai. Hum concept tou clear kertay hain, lekkin jab question answer yaad kernay per tay hain wo ratta he lagatay hain"

Children are now not even left competent enough to do creative writing. They get the concepts in Urdu. They get a know-how of what they're being taught but they can't do creative writing. They don't have a good enough hold over vocabulary or sentence making. Rote learning has increased. We try to clear their concepts but when it comes to learning question answers they just cram them.]

The teachers also said, the children don't have any concept at all in English but in Urdu they are still able to get the concepts as they are familiar with the language. If we try to explain them a definition they learn it as it is and rote memorize it without understanding the concept, which means they don't learn anything. For example, if we teach them about vertebrates and invertebrates, they start understanding in Urdu and also express in Urdu but when told something in English they never respond.

"English main in ko yaad nahi hota, wo parthay he nahi hain. Understand he nahi ker patay is sentence main kia keh raha hai. Kuch bachay ye bhi kehtay hain English main itna lamba likha hai hmain short ker k isko btayain. Bachoun ka jo knowledge barhna tha wo km hota ja rha hai barhnay ki bajaye. Ratta system ageya hai. Itni lines yaad kerlo. Kuch short questions ka method examination ka 2,2 number ka. Dou, dou number walay sawal yaad kerlo. Apni soch se tou likhna he nahi hai".

[They are unable to memorize it in English, they don't learn. They don't understand what's been said in the sentence. Some students complain that the sentences in English are so long we should make them short. The knowledge that was supposed to increase among students is decreasing. Rote learning is prospering. Just learn these many lines. In examinations short questions have been introduced, questions worth 2 marks each, so they just learn few line for 2 marks questions. They don't write anything from their intellect.]

"Halnkay hum ne bachoun ko sara syllabus khatam kerwa dia huwa hai, inki revision chal rahi hai. Main ne aik bachi se subha poocha beta ap btao is blank main kia ana hai? I have _____ sisters? She was all silent and at the same time dousri bachi ne kohni mar ker kaha btao na apnay mama papa ka naam".

[Although we have already gone through all the syllabus and now we are just revising I asked a girl to fill this blank "I have _____ sisters?" she was just blank. Upon this the girl beside nudged her and said tell her you mama, papa's names.]

Rote learning in Students understanding

Memorization or rote learning was a key outcome of the change of the medium of instruction. While conducting classes we asked the students what is meant by *ratta*? In the words of one the student,

"Begair samjh ey jab hum yaad kertay rehtay hain tou ousay ratta kehtay hain"

[When we memorize something without understanding it, it is called ratta.]

We put it to them that many people say that even when the books and medium of instruction was Urdu students used to cram so it was nothing new if they were now cramming in English. How did they look at the matter of cramming in English or Urdu?

One of the girl in high school science section explained this brilliantly

"Miss ye theek baat hai k hum Urdu main bhi ratta lagatay thay. Laikin Urdu or angrazi k rattay main ye farq hai k Urdu ka ratta hamain samjh ata tha or hum khud se likh saktay thay. Angrazi ka ratta hamay samjh nahi ata k hum kia yaad ker rahay hain aur khud se likh bhi nahi saktay. Ye farq hai Urdu or Angrazi k rattay main. Angrazi ko ratta laganay main time bhi ziada lagta hai aur ye jaldi bhool bhi jata hai"

[Miss, it is true we used to cram it in Urdu, too. But there is a difference, we could understand Urdu cramming and we could write it in our own words. We don't understand what we are cramming in Engish and we cannot write it in our own words. This is the difference. We also spend more time cramming English and it is soon forgotten.]

Teaching in two languages

Majority of the teachers indicated that the students understanding of English is very low. And if one delivers the whole lecture in English they cannot understand a word of it and that the medium of instruction is the bottleneck to acquisition of content and knowledge.

"Pehlay hum urdu k used to thay. Phir English main hogeya. Ye nahin k hum English main parha nahi saktay. Bachoun ka masla hai. Jo hmay pick nahi ker saktay".

[Earlier we were used to of Urdu, then it all changed to English. It is not that we cannot teach in English, it's the children who cannot understand us.]

So teachers translate or explain the whole concept first in Urdu and then in English which enables the students to understand what the chapter, lesson or subject is about.

"Hmari book jo hai wo English main convert hogai hai laikin hum isko Urdu main he parhatay ya seekhatay hain. Kioun k agar hum isko English main keranay lug jayain teacher ne tou Msc, MEd kia huwa hai wo tou shayad ker le laikin jo bacha hai isko tou samjh nahi lagay gi kioun k iski language he nahi hai".

[Our book has been converted to English. But we teach and explain everything in Urdu. Because if we teach them in English, the teacher who has done MSc MEd might understand, but the students won't because this is not their language.]

"Donoun language main translate kerna perta hai. Is se ye hota hai k ap tou translate ker laitay hain oun ko urdu main cheez aty hoti hai. Oun k dimag main hoty ha. Lakin jab wo likhnay lagtay hain English main oun ko nahi ata. GTM of use jo hai. Learning second language wo aik both bara drawback hai. Grammar Translation Method. Jis main hun translation kertay hain".

[We are bound to explain them in both the languages. But what happens is they know everything in Urdu they have it in their minds, but when they have to write in English they can't do a good job. They use GTM. Grammar Translation Method, by which we translate to learn second language. It is a huge drawback.]

"ye jo base hai iska primary se wasta hai. Bohat se bachay hmaray pass atay hain jin ko reading kerna nahi araha hota. Wo kia understand kerain gay isko. Is k liye apko double waqat chaiye. Kioun k pehlay ap urdu main instructions detay hain or phir ap isko angrazi main kerwatay hain reading".

[This base is affiliated to primary. Many students come to us who face difficulty in reading. What will they understand? For that you need double the effort (time). Because first you give all the instructions in Urdu and then you get them to read in English.]

"Lecture 35 minute ka hota hai. 35 minute main apne sunana bhi hai, phir inko teach bhi karna hai. Pehlay English main perhayain phir urdu main translate kerain phir isko explain bhi kerain. Ab 35 minute main kesay cover kerain. Phir bnda achi tarhan se nahi samjha pata".

[Lecture is of 35 minutes. In those 35 minutes you have to revise the previous lesson. Then you have to teach them first in English then translate it into Urdu and then also you have to explain it. How can all this be covered in 35 minutes. So you cannot teach them very effectively.]

"hmaray liye problem ye ha k isi ko pehlay English main parho isko translate urdu main bhi kero. Aik kaam ka double burden hogeya ha. Kioun k bachoun ko English main samjh nahi ata. Isliye translate kerna perta ha".

[Our difficulty is that we first tell them in English and then translate it in Urdu as well. Our burden has doubled. Because the students don't understand in English that's why we have to translate.]

The issue of teacher training

The British Council launched the Punjab Education and English Language Initiative (PEELI) in 2013 in conjunction with the Directorate of Staff Development (DSD) that aimed to train 180,000 primary and middle school teachers who teach English, Maths, Science and Computer Science (British Council 2014). Teachers in this study reported participating in some form of training provided by DSD. However, according to participants, the training did not adequately prepare teachers for performing their job in English. First, the length of the training was quite limited, and it occurred during the break between academic years.

"Hmay reference courses kerwaye gaye thay chutiyoun main wo dou (2) haftoun k hotay thay"

[We were made to take two weeks long reference courses during the holidays.]

Second, the content of the training was also quite limited.

"The head teachers were made to do an English course of 10, 15 days or 1 month and even in the 15 days of our course we used to try to adopt English way of speaking because we were said to deliver our lesson in English."

When they were asked if it made any difference?

The principal said: "it made very little difference and in case of some teachers it hasn't made any difference at all".

"Han trainings tou hui hain. 5-10 din ki.

[Yes the training took place of 5 to 10 days.]

When they were asked if it made any difference?

"jo dus (10) din parhi hui hain wo kesay ker lain gi. Bus Allah tawakal chal rahi hain"

[Those who studied for 10 days, how can they perform? It's not training, it's God's help.]

It consisted of basic English for a general teaching audience. Some teachers commented on the low level of English that the training provided.

"Fifteen days reference courses were offered to the teachers"

"Training hmay ounhoun ne di thi, aik aik ko pachis (25) din ki thi".

[They gave us the training. It was of 25 days for each person.]

"Han yehi [DSD] keratay hain hmay training di or spoken English ka course keraya. 2004 main kerwai phir 2007 ab ounhoun ne 2010 main kerai ha"

[Yes they (DSD) arranges this, they gave us training and gave a spoken English course. It was given in 2004, then again in 2007 and latest was given in 2010.]

Extra duties of teachers

Teachers are given extra administrative duties too apart from teaching. Teacher's complained that they get little time for their household activities and even for preparing lessons. They have to teach in dire circumstances. There are many policies

which go side by side such as to increase enrolment and teaching in English. So for those schools where there are only 2-3 teachers they have to go door to door for parent's awareness to educate their children but when they are away someone should be at school to teach students in 'good English'.

"Koi aik duty hai, bachoun ko enroll karein, dengue k liye, election per bhi hmari duty lagti hai. Mardum shamari per bhi hmari duty lagti hai. Hmay kaha jata hai k 4-5 saal k bachoun ko school main admission k liye le ker ayain or ous k ghar waloun ko b motivate kerain. Hmay mahsoos hota hai k gaoun main ye zaroori hoga magar shehr main iski zaroort nahi, magar order her jagha circulate hojata hai".

[It's not just one duty. We are told to enroll students, we are assigned duties for dengue [epidemic] and at elections. They even give us duty during census. We were asked to bring children of ages 4-5 to school for admission and to motivate their parents as well. We feel that it might be necessary in villages but in cities it is not needed, still the order is circulated everywhere.]

Teachers also complain that the government does a lot of cost cutting and doesn't hire enough staff. Many posts are open but government does not do recruitment. In one of the Girls middle school an acting head teacher reported:

"Hmaray school main bachoun ki tadad 232 ha or 3 teachers hain. Jabkay school main teachers ki 10 posts hain jin main se 7 khali hain or baqi 3 feeder teachers hain oun ko hum ne temporary basis pe rakha hai. 1 ne F.A kia ha or baqi 2 ne B.A kia ha. F.A wali ko hum 3500 detay hain jabkay B.A walioun ko 5000 detay hain. Ye paisay government hmay daiti ha k agr hmay koi chowkidar rakhna ha tou rakh lain. Koi teachers chaiyain tou rakh lain. Lakin proper teachers jin ki posts khali hain wahan per bharti nahi ker rhy"

[Students strength in our school is 232 and there are only 3 teachers. Whereas there are 10 posts of teachers out of which 7 are vacated. We have 3 feeder teachers which are hired on temporary basis, one has done her F.A and the other 2 has done their B.A. We pay Rs. 3500 to F.A one and Rs. 5000 to B.A. Government gives us this money so that if we need any watchman, teacher then we can hire them. But proper teachers whose posts are vacated are not being filled.]

"Kahi dafa tou Sunday ko bhi ana perta hai. Aksar ana perta hai. Dangue k liye hum Sunday ko atay hain. Is dafa hamay, samjhayin, garmioun ki chuttiyan nahi huin. Her dousray din aye huye thay.

[Most of the times we have to come on Sundays, we have to come often. For dengue (campaign) we come on Sunday. You can say, this time we didn't get summer break. We had to come every other day.]

"Ji! or bhi kaam kernay pertay hain. Jab election hotay hain ous pe duty detay hain, polio campaigns, dangue k liye school ki safai kerwatay hain, gamlay b saaf kerwatay hain"

[Yes we have to do other tasks as well. We give duty during elections, during polio campaigns. We look after the cleanliness in school for dengue, we get the plant pots cleaned.]

Rescuing a failed policy: Change in the method of examination

There was also a change in the exam papers, it is now divided into two parts with more weightage given to the objective questions as opposed to the subjective ones.

"The papers now have a large portion of objective questions. There are 40 marks for subjective and 60 marks for the objective part. The teacher keeps this in mind while delivering the lecture so that the student is at least able to do those objectives in the paper"

"Jo ab paper pattern hai wo itna ziada theek nahi hai. Is main bachay baray aram se aik dousray ko dekh saktay hain. Yani cheating k chances barh gaye hain. Subjective kum kerdia ha or objective ziada kerdia hai. Naqal kernay k chances barh gaye hain. Aik dousray se pooch laitay hain"

[They current paper pattern is not that effective. In this students can easily cheat and copy from each other. Which means the chances of cheating have increased. Subjective portion has been reduced and objective has been increased. The chance to cheat has increased. They ask each other.]

Since most students find it difficult to grasp concepts in English or to explain and write these, they leave the subjective part or attempt a short portion of it, preparing for and mainly focusing on the objective questions to pass their exams.

A discussion with the teachers about this change revealed that even though students may gain enough marks to pass the exam, they hardly have any understanding of what is being taught. Comprehension has fallen to a very low level and most of the students just depend on rote memorization.

"40 MCQ's hain 60 marks k or jo subjective hai wo 40 marks ka hai. Nineth main 12-15 k MCQ's hain or phir agay 3 long questions. Practical main bhi aisay hogeya hai k jo practical main kerna hai wo written ker k dikhayain. Ab bachay ous ko rattay hain. Practicals ko lab main kernay ki bjaye ous ka parcha solve kertay hain. Yani jo oun ki evaluation hogy wo lab ki practice per nahi hogi balkay jo ounhoun ne ratta lgaya ous per hogi"

[There are 40 MCQs worth 60 marks and the subjective is worth 40 marks. In 9th grade MCQs are 12-15 followed by 3 long questions. Same is the case with the practical that what you have to perform you give it in the written form. Students just cram that. Instead of performing practicals in the lab they just give it in written form. Which means their evaluation will not be based on their practice in the lab but on basis of what they have crammed.]

"Objective ne number lena boht assan kerdia ha. Hmaray pass aisay cases hotay hain jin ka hmay 100 per cent yaqeen hota hai fail hojayain gay per wo sirf objective ki waja se tukkay wagera laga k pass hojata hai"

[Objective has made taking marks easy. We have such cases that we were 100 per cent sure that they will fail but just because of objective and guess work they pass.]

Students background

Most of the Government Institutions that were visited had students from a very low social status. They came from families of wage workers, laborers and domestic workers which made them the first generation to attend school. Hence they had little or no help from home in their studies. Meanwhile, their lifestyle was very different from students of a better class. The teachers found it difficult to train them as they did not even have the basic grooming that other students get from their homes.

"Yahan tou system he alag hai. Yahan tou quarter system hai. Aye din koi na koi change ho jata hai. Kouthioun wali nikal deti hain. Servant quarter main bachay rehtay hain. Abhi hmaray paanch (05) bachay ounhoun ne nikalay hain, kal parsoun. Ab wo kia ker saktay hain".

[Here the system is totally different. Here it is [servant] quarter system. Every other day someone has to move. The landlords evict them. The children live in servant quarters. They have just thrown out five of our children the other day. [The children and their parents can't help it.]

"Jo boht ghareeb bachay hain ounhoun ne tou kabhi kitaab khol k nahi dekhni kitaboun main hai kia. Un ko tou Urdu nahi ati. Jo bachay servant quarter se atay hain oun ko tou uthna bethna nahi ata. Ab bathroom k liye wo poochain gay 'teacher g main mouter ker aoun?' Tou jo bachay government schooloun main arhay hain wo tou aisay he hain k ounko hum kia seekhaain Urdu, Angrazi ya manners. Class main janay ya anay ka tareeqa batayain "

[The students who are extremely poor they will never open their books to read what it says. They don't even know Urdu. The students who come from servant quarters they are not even groomed to carry themselves. Now to leave for the washroom they will ask if they can take a piss. So such are the kids that are coming to government schools, what should we teach them Urdu, English or the manners to attend class.]

They are so poor that they cannot afford even two meals in a day. Teachers reported that most of the times in assembly they [students] fell because of low blood pressure, are pale and undernourished.

"Aik bachi ko teacher le ker ayi hain. Bachi roz late ati hai, perti nahi ha. Mian ne bachi ko pyar se poocha, beta! Ap kioun late ati hain. Mujhay btao main kisi ko nahi btaoun gy. Kahti ha madam meray abu or ami subah Data Shb se khana latay hain. Wo hum nashta kertay hain, phir hum school atay hain.

"Ye boht ghareeb gharoun se hain. Hand to mouth hain. Is waja se difficulty mehsous kertay hain. Ye aam log houn tou ye shru se he achay schooloun main jayain. Ye kafi poor hain.

[They are from extremely poor families, hand to mouth families. That is why they face difficulty. If they were from normal families they would attend better schools from the beginning. They are very poor.]

Introducing a language such as English or even Urdu was a challenging task as these students only know their mother tongue. Students coming from households where the basic needs such as food and shelter are a struggle to meet, education has no importance for them. They also have no exposure to a foreign language.

"yahan ka jo area hai. Jo gharilou mahoul hai, parents ki tuwaja wo bhi cheez count kerti hai. Sub log tuition afford nahi ker saktay. Mothers wo gharoun main kaam kerti hain. Baap aksar bachioun k mazdouri kertay hain".

[This area, the home environment, parents' attention all count. Not everyone can afford tuition. Mother's work in others homes and fathers do wage labour].

Most teachers had the same to say about the students from lower background. We were told that these students get no help from home, they usually work from a very young age as it is a matter of survival for them. They have to work to earn even their everyday food, life is a struggle for these kids and their families. Hence school and education is not a priority for them, rather a formality. They're pretty helpless in the position they are in.

"Aik tou kafi saray inn main part time job kertay hain. Inn ko dou se teen sou rupay mil jatay hain. Wo kehtay hain yahan parna tou beqar hai. Inn ka social network itna complicated hai, ounhoun ne sochna hai k main ne kamana kesay hai. Falana kaam kar loon, poshish ka kaam karloon ismain bhi paisay ziada hain. Phir bachay ne kia sochna hai [parhai k mutaliq]".

[A lot of students among them work part time. They get two to three hundred rupees [a day]. They feel that to study here is useless. Their social network is so complicated. They think only about how they can earn, to work at this or that, perhaps, to get into upholstery work as there is more money in it. Then how can they think [about study].]

"Meray khayal main jo bachay hi hain, Jo is school main bachay hain, wo sb chhabri faroushoun k hain. Jab parents inko kuch bhi nahi bta saktay,,jab bachay yahan se gharoun main jatay hain, wo books bund ker detay hain, wo gharoun main kaam kernay jatay hain. Inn ko aik time ki roti moyyessar nahi hai".

[I think the children here in this school are all children of hawkers, their parents can't tell them anything. When they return home they just close down their books, they go home to work. They don't get a single square meal in a day.]

"subha teacher meray pass aye gi or kahay gi madam in bachoun ne kaam nahi kia. Meray pass bachay lay ayain gi. Main bachoun se poochti hun, bachyan rona shru kerdain gi. Phir pyar muhabat se sbko bhej ker poochti hun beta kia masla hai, "Madam hum ghar ja kar kantay bnati hain. Time nahi hota hum parh sakayain."

[In the morning the teacher will come to me and complain madam these children didn't do their homework. They will bring students to me. When I ask the students they burst into tears. Then after sending everyone away I ask them softly in privacy what is the issue. They reply that they make (ear rings) jewelry when they get home and don't get any time to study.]

Impact on Urdu

Many teachers feel that because of this policy there are grave impacts on Urdu language. When a particular language has no role to play in the education system it becomes marginalized and neglected. Moreover they feel that there is a deliberate policy of killing Urdu language as denying it an important role in the education system is equivalent to suffocating it. They opined that the student's ability to read, write in Urdu is deteriorating day by day.

"kawa chala huns ki chal apni chaal bhi kho betha", bachoun k saath ye howa ha. Angrazi k chakar main oun ko Urdu b bhool gayi ha

[He that apes others will never be himself. This is what has happened with children. While struggling for English they have forgotten Urdu…]

"Automatically aik language ap per dominate ker gayi hai doosari language per asar tou paray ga na, tou isi waja se jo Urdu pehlay bachay likh perh laitay thay wo kafi khrab hui hai"

[Automatically when one language dominates you, then the other language will necessarily suffer. Due to this reason the ability of reading and writing in Urdu has greatly suffered]

"G, bilkul medium of instruction change huwa hai iska khamiaza hmay hy bhugtna par raha hai. Pahli dafa huwa k Urdu main Science class ki bachiyan jo hain wo fail hui hain. Hum donoun cheezain bhool rhy hain. Na hmay Urdu aty hai na English. Inhain in donoun main se kuch nahi araha hai. Pehlay ye hota tha k jo English nahi ker patay thay wo Urdu main pass hojatay thay. Ab ye horaha hai k na inhain English arahy hai na Urdu. Inhain donoun main se kuch nahi araha or government ki taraf se order hai jin teacheroun ka result nahi acha inko ye punishment ho tou wo punishment ho"

[Yes, the medium of instruction has changed and it is we who are paying the price for that. It's the first time that Science class students have failed the Urdu exam. We are forgetting both things. Neither do we know Urdu nor English. They are not able to understand any of these. In the past it used to be that those who were not able to pass English would pass the exam in Urdu. But now they are not able to understand either

English or Urdu. And government has ordered that those teachers who are not able to produce good results should be punished.]

"Physics, Chemistry or Biology per ziada time lagta hai tou Urdu or Social Studies ignore hojatay hain jo k score barhatay hain. Abhi b bachoun ne social studies main suppli li. Hmaray school main jis ne 514 number lye hain is k bhi Urdu main km marks hain. Or ab bachay Urdu or Social studies ki rechecking kerwa rahay hain k kioun is main hmaray kam marks hain."

[Physics, Chemistry and Biology tend to take more time so Urdu and Social studies are ignored, which are scoring subjects. Still many students have failed social studies. In our school the student who has scored 514 marks has low marks in Urdu. And now students are having their Urdu and Social Studies papers rechecked to know why they scored low marks].

Discussion and Conclusions

Most of the research carried out on the impact of the change of the medium of instruction in 2009 is in some way consensual although different categories of researchers touched and approached the topic from different angles. The main category of researchers comprised NGOs, some doctoral students the British Council, independent analysts and social scientists who have interest in the issue.

Most of the NGOs and the British Council now agree that the policy to teach in English medium of instruction in the government schools has failed. They also agree that as a result

- cognition of students has decreased, and
- ratta, learning by rote, has increased

As for the reasons for failure of the policy there are major differences. Most blame teachers who, they say, do not have the capability and competence to teach in English. According to them these teachers even themselves struggle to understand what they are supposed to teach. There is need to teach the teachers first. The British Council reports that the capacity to teach in English of the majority low-fee private school teachers who have been and are teaching in English medium already is even lower than that of government school teachers. Most of the independent research workers like Rahman (2004), Mustafa (2011) and many others consider the very idea of adoption of a foreign language as the medium of instruction against all research and experience gained over the last century. Children should be taught in their mother tongue and only after they have attained good proficiency in reading writing and speech in the mother tongue should a second language be introduced. These workers do not buy the justifications given by the government while introducing the policy that English was the language of science and technology and that English MoI is necessary if the country has to develop in science and technology or benefit from the fruits of globalization. They quote numerous examples of Nordic countries, France,

Germany, Japan, China and Soviet Union who all developed using their own language and in fact because they used their own language.

Unlike many of the above cited reports which focused on assessment of students and the English language skills of the teachers this study focuses on the perception and experience of the teachers. These perceptions and experience have been quoted in raw form in the section on Investigations and Results. A study of this section reveals that while the government school teachers may be deficient on English language their perception of the educational process and pedagogy is insightful and deep. The teachers have a strong feeling that change of the MoI was an externally imposed agenda worked out by people who did not understand the context of the local students. It had done more damage than good to the students' education. They emphasized the socioeconomic context of the students which they were very familiar with. They emphasized the significance of relating teaching in class to the preexisting store of knowledge and to the everyday life and experience of their pupils.

The issue of teacher training has also received much importance in the studies mentioned above. British Council was authorized by the Punjab Government to set up many master trainer centres who would then organize further training for a larger body of teachers. The results of such training organized on a limited level in the initial stage did not make any significant difference to the capability of the teachers. After all almost all government school teachers are BA, BEd or MAs already and have studied English as a subject for many years and at least a part of their study was conducted in the English MoI after school. So what drastic improvement could be expected through an additional two weeks or one month's training?

The focus on English MoI between 2009 and 2013 had many other deleterious results among which loss of capability in Urdu deserves special attention. A large number of government school students had a good grasp of Urdu in the past in which language they easily developed facility for reading, writing and speech even when it was not their mother tongue because it was, so to say, around them in the environment. Focus on English not only turned the students away from Urdu but also sent a strong message of the secondary importance of their national language in which proficiency was meaningless. For the first time according to teachers some good students failed Urdu. For the urban Punjabi students Urdu had almost become a second mother tongue and the loss of Urdu for them was loss of identity and confidence. Many students who could not get a high degree of competence in English even after their masters at least had another language in which they enjoyed reading literature and poetry and could connect themselves to the wider world.

The most commonly received opinion of various policy advisors is that the government school teachers are incompetent and inefficient and require a tight monitoring framework for consistent work. It is also believed that the degrees they bring from the government institutions of higher education are likewise worthless and unreliable. The incompetence of government school teachers is also hidden in the

query that if EMoI could be successful at the elite private schools why would it fail at the public schools?

The answer to this critical question became apparent to us only after visiting many schools. The consistent propagation of the narrative of absenteeism and incompetence of the teachers and poor infrastructure and the lack of electricity, water and toilet facilities at many government schools has pushed whichever parents could afford to pull their children out of these and admit them to low fee private schools so that only the poorest still remain at the government schools. These are the sons and daughters of wage workers, maids, hawkers, chowkidars who cannot afford even the low fee private school and a government school is closest to their place of living. As discussed before most of these children have to work after school hours or do the household chores while their mother works at a middle class household to earn the rent, utilities and food expenses. These children do not have a stable life or exposure to English language. Many of them don't open their books or study at home. Even while at school their mind is either preoccupied with the possibility of the job after school or the next meal.

As for the previous generations of Urdu medium students they belonged to mixed classes started their English as a subject in class six. Many of them dropped out mostly because of English at class 8 or 10 or 12 and those who survived these English barriers might graduate or go on to do their masters. However, they could go only as far in English proficiency as their current teachers and according to the British Council study (2013) "even in the English medium private schools, 44 per cent teachers scored in the bottom Aptis band".

So its not just the school and the teachers it's the social class of the students which creates a barrier against a foreign language. The teachers are not wrong when they say even a British teacher will be hard put to teach English to these students.

Even more important, the issue of the medium of instruction cannot just be limited the process of education. Underlying the medium of instruction is the language issue which is not a new issue nor limited the recent period of globalization. Critical scholars such as Bourdieu (1991) Fairclough (1992), Foucault and Sheridan (1979), Paulo Freire (1985), Gramsci (1988) Shohamy (2006) and many others focus on the critical issues of access, equity, and justice. Gramsci holds language is a power question and a tool for class domination.

This study is about the impact on cognition and environment of learning in school after the imposition of a foreign medium of instruction. An equally important area for investigation is the impact on cognition and environment of learning for the students who take admission in English medium private schools which have been using the English medium for decades and some since before partition. Without a reference to these schools the present study would remain incomplete. These private schools fall in two major categories one the elite schools like Lahore Grammar, Beaconhouse, Karachi Grammar, Aitchison, Roots etc and the others lower down, most of which are known

as the low fee private schools. Hundred per cent of these private schools are English medium. They have never been investigated. Given their reputation, recognition and class the elite schools are accepted as the role models, no one underneath dare challenge them. Second, third and still lower rate low fee private schools enjoy the wall of protection of the main house and likewise escape investigation. Second, private schools have an ownership with attached vested interest who will defend them against criticism and assault. Interestingly the state on the other hand has been resonating and amplifying all criticism of the government schools and has been all too ready to part with the ownership and hand them over to private sector with huge subsidies, considering them a burden and a drain. Manan, however, (2015) has investigated low fee private schools in Quetta and concludes conditions in low fee private schools are as bad if not worse than those in government schools. Even the British Council in its study (2013) to assess the working and failure of 2009 change of the medium of instruction in the government schools of Punjab acknowledged that in some ways, especially the quality of teachers, they were worse than the government schools.

The sudden imposition of English medium of instruction was so shocking it moved the school teachers into a welcome semi-philosophical discourse about the role of language in learning. In Pakistani academia such opportunities are rare at mass level. In our discussions with teachers we were impressed by their involvement and eagerness to express their experience. A few, however, were ambivalent because while they could see the EMI had obviously failed, on theoretical grounds they were still convinced of the discourse that the country needed English to compete in the world. The teachers had obviously given the issue thought and been discussing it. The very simple school teachers had considered changes in cognition, changes in examination, and impact on Urdu. They were modest enough to admit their own weaknesses but strong enough to ascribe motives. They showed empathy love and understanding for their wards.

Most studies regarding the impact of recent change in the medium of instruction have adopted a mechanical approach which focuses more on the measureable aspect of English teaching and student learning. They do not focus on the understanding of the problem which only emerges from its larger contextualizing and social linkages. One of the main findings of our study was the need for a holistic and qualitative approach to the problem of medium of learning. We were, pleasantly surprised to find that the relationship of many Pakistani The teachers also looked at the philosophy of the role of education in the light of their own personal experience.

At the end it would be interesting to note the observations of the great Latin American educationist, Paulo Freire on the issue of language.

"Educative processes can never be neutral. They either inculcate dominance or liberate people. Educative processes domesticate people where there exists a dominant culture of silence. Such an educative process simply deposits information limiting our social reality to what we are taught. It takes away our perceptive analytical abilities and denies the power to think and challenge" (Friere 1996).

Notes

[1] Although a new census took place in 2017, only an executive summary has so far been released, and details have not yet become available.

[2] Percentage of Urdu Speakers

The 8 per cent figure for Urdu speaking population, too, needs closer scrutiny. Schools in Punjab require the children to speak Urdu. Thus nearly all school going children especially girls end up speaking Urdu even outside school. In continuation of the school policy educated Punjabi speaking parents too end up speaking Urdu to their children. Thus Urdu has come to be the "mother tongue" of a large number of Punjabi urban households.

[3] More recently Jawwad Khwaja as Chief Justice of Pakistan made one last heroic effort in September 2015 calling upon the state to meet its constitutional obligation and make Urdu the national language in all spheres of life and report to the Supreme Court on the progress made. It met the same fate as all other initiatives in the past because not only the sovereignty has been lost, but this is a moment in history when, even identity has been lost and there is hardly a major lobby in the country which favours adoption of Urdu as national official language and as the medium of instruction.

[4] The British Council's computer-based Aptis testing software to assess the proficiency in speaking, listening and writing in English.

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ANIKA KHAN

GROWING UP IMMERSED IN A VIRTUAL WORLD

Abstract

With growing access to cyberspace, children and adolescents are increasingly experiencing the world virtually. Simultaneously, virtual technology is becoming more immersive in both senses of the word: three dimensional and more 'real' but also carrying the capacity to engage our attention more than the world of flesh and bone. The growth of the internet and virtual media has been accompanied by the hype and anxieties that historically seem to surround technological developments. While virtual mediums have opened the door to knowledge and experiences that were previously inaccessible to many, they have also raised concerns about the gradual replacement of first-hand encounters with nature, sensory experiences and social interaction - for instance, experiencing a natural location through an immersive app, tending to virtual pets and virtual friendships on social media. In particular, there are grave fears about the unforeseen impact on children growing up in a virtual universe where they may be no moral boundaries and no consequences for perpetrating acts that would be immoral in the 'real-time' world. Cyber-bullying and witch-hunts on social media are the artefacts of our time.

Research literature emerging in the last two decades has explored different dimensions of human activity in the virtual realm. Historical research shows a fascinating symbiosis between the internet and its users who have shaped virtual media and given the internet its evolving form through the uses they put it to. However, there is still ambiguity about how virtual mediums are influencing patterns of socialization and morality, particularly in the generation that is now passing through adolescence and which has never experienced a world without the internet. Research conducted so far presents divergent accounts of virtual human engagement. Some studies indicate that while young people spend increasing time socializing online and 'friending' others, they are paradoxically at risk of becoming more isolated as they interact in loosely connected groups in which participation is temporary. A number of papers have addressed the nature of virtual friendship and questioned whether it can have the same depth and meaning as the ties of friendship that bind us in physical life.

Other studies, some conducted very recently, show a different picture: they posit that virtual mediums are frequently used for augmenting existing relationships, maintaining contact with acquaintances and staying abreast of news and events within families and communities. Contrary to the dystopian bent of some literature, the bulk of emerging research indicates that adolescents use virtual mediums for the same activities they have engaged in over millennia: playing games, exploring the world, creating identity, 'hanging out' in public places with other young people and creating private spaces, away from parental supervision. The majority of these studies conclude that virtual technology is just one more technology that humans will incorporate into their lives and take in their stride.

Through a review of scholarly work this paper discusses whether human interaction with 'natural' and virtually constructed worlds is qualitatively – and morally - different. To augment an understanding of the topic, the paper also explores informal conversations piloted with two focus groups: adolescents who use gaming forums or social media and parents of adolescents. The themes emerging from the group discussions tend to corroborate recent research: adolescents see the online world not in contradistinction to the 'real' world but as a part of the same reality, in which they can express certain aspects of their identity. Nonetheless, the author concludes that while the turn-of-the-century moral panic engendered by virtual technology may be subsiding, the coming decades will show us the subtle ways in which technology has changed us, as surely as we are changing technology.

Key words

Introduction

> "I want to see you not through the Machine," said Kuno. "I want
> to speak to you not through the wearisome Machine."
> E. M. Forster – The Machine Stops 1909

E.M. Forster's early twentieth century story, *The Machine Stops*, begins with a conversation that, over a hundred years later, seems disturbingly familiar. A mother and son on opposite sides of the globe converse through plates that light up and allow them to see and hear each other. In the fictional world of the story, people communicate through technology and face to face encounters – even between a mother and a son – are rare and uncomfortable. "I want to see you not through the Machine," the son says poignantly.

Forster's story is powerful because it presciently echoes the fears of an age in which virtual technology has become ubiquitously intertwined with daily life, socialization and communication. We use the technology that we have created and wonder whether it will overrun and conquer us. We worry that it may fragment our human collectivity into billions of individual, disconnected particles. We fear that our children will lose their way in cyberspace and never come home.

With the growth of the internet and the proliferation of electronic devices that mediate human experience, new questions have arisen about the boundaries between real and virtual worlds. A colleague related an anecdote that epitomizes the bewilderment of adults witnessing their children growing up in a digital age. He told the story of a recent family vacation to a Himalayan valley in Northern Pakistan. Amid the breath-taking scenery and the grandeur of the mountains, his children constantly played Pokemon Go, an augmented reality game in which Pokemons (fictional cartoon creatures) appear superimposed on a screen display of the player's actual physical location.[1] He recalled that his feelings at the time were equally compounded of frustration and bafflement. When he asked his son to leave his

phone and look at the beautiful surroundings, his son responded in surprise that he *was* looking at the surroundings...through his phone, as he played Pokemon Go.

The story is reminiscent of most people's experiences of dealing with adolescents immersed in a virtual world and handling what Gergen (2002) calls "the challenge of absent presence." Disengagement with the world in which we are physically located seems to increasingly characterize the spirit of our times. Through the agency of our computers, tablets and smartphones, technology abets us in escaping the interminable journey, the tedious lecture and the wearisome family gathering. But by withdrawing ourselves from the demands of social interaction, are we damaging ancient rituals of kinship and cooperation? Will we never be bored again, only to discover that boredom was somehow indispensable to human creativity and imagination? Most pressingly: are we becoming less human – or an even more disquieting possibility – *more* than human, as we mesh more and more with technology?

There are no easy answers to these questions. In the last two decades, the phenomenon of virtual engagement has been written about extensively and a significant amount of research is emerging, providing some inkling of human behaviour and socialization on the internet. But for the most part, research literature so far presents two divergent narratives. One stream of thought foresees a somewhat dystopian future in which our increasing preoccupation with a virtual world is making us isolated, individualistic and increasingly self-absorbed; the other sees the internet and its media (social media, in particular), as tools that help professionals, friends, families and communities stay in touch, while simultaneously widening their sphere of socialization. This more recent stream of writing and research views virtual technology as just one more technology that humans will take in their stride.

Through a review of research and literature, this paper looks at different aspects of virtual interaction and socialization on the net, particularly by adolescents, and their possible moral and sociological consequences. The paper also attempts to connect these discussions to Pakistani perspectives by briefly presenting themes from informal conversations piloted with two small focus groups, one consisting of teenagers, the other of parents of adolescents. The term 'virtual' is used in this paper to imply all experiences and media that exist online or are accessed through electronic devices.

Technology and human disquietude

> "The more things change, the more they stay the same."
> Jean-Baptiste Alphonse Karr, *Les Guêpes* 1849

The advent of new technology creates talking points in history. Much as we agonize today over the possible impact of virtual media on our lives, or celebrate the egalitarian influences of a technology that seems to override differences of wealth, race, gender and geography, people in the past debated over the printing press, the

telegraph, electricity, the radio and the telephone (Marvin 1988). New technologies create anxiety as they change the ways in which we communicate and express ourselves. They challenge the distances at which we have determined it appropriate to keep others, bringing them closer than we intended, or removing them to a more distant sphere. Simultaneously, we adapt technologies, sometimes in unforeseen ways, and use them as extensions of our existing needs of socialization and communication.

Baym (2010) writes that technology does not appear in a vacuum but within a social context that influences the shape it takes and determines the changing functions it serves. Consequently, the interface between humans and technology causes shifts in established patterns of human interaction and as societies regroup around new ways of communication, these new "social affordances" (Wellman et al. 2003) create needs for communicating that previously did not exist. Ultimately, as ubiquity breeds familiarity, technologies fade into ordinariness and "become invisible" (Baym 2010).

The history of the internet seems to follow a similar trajectory. Beginning with experimentation in the early 1960s, the first public demonstration of network technology (in the internet's earlier incarnation, ARPANET), was made at the International Computer Communication Conference (ICCC) in 1972 (Leiner et al. 1997). In the same year, electronic mail was introduced. The development of the internet was followed by the first implementation of the World Wide Web (WWW) in 1991, an exciting development which enabled search engines and browsing. The first users of the internet and the Web were mostly young, white men in North American universities and organisations. In its early years, the Web allowed groups of people with similar leanings to come together, often anonymously, to discuss subjects of specialized interest (Haythornwaite and Wellman 2002). Expanding rapidly, the technology was soon embedded in the everyday life and sociality of people all over the globe.

The literature of the period reflects the hopes and anxieties that seem to accompany the innovation of technology, ranging from the hyperbole of utopian fantasies (see Barlow 1996) to dystopian fears that we would lose the essence of our humanity. Gibson's 1984 science fiction novel, *Neuromancer*, coined the term "cyberspace" and envisioned it as "A consensual hallucination experienced daily by billions of legitimate operators." The individual nature of internet communication – one isolated person seated before one computer – led to concerns that traditional communities would be weakened if our connections with others were solitary, anonymous communications, mediated primarily through the internet.

Reflecting the disquietude elicited by earlier technological innovations, there were concerns that digital technology would harm our memories and our capacity for reflection. In 2008, Carr's article in *The Atlantic* "Is Google Making Us Stupid?" dwelt on the ways in which technology was changing us. In his article, Carr quoted blogger Bruce Friedman's comment on the changes wrought in him by his online activity: "I can't read War and Peace anymore." Towards the end of his article, Carr made an interesting point about the invention of the printing press and the

"doomsdayers" who had opposed it. In his opinion, the "doomsdayers" may have been right: changing the ways in which humans expressed themselves probably led to a withering of the abilities nourished by a particular way of communication. What could not be predicted was the ultimate development of a *different* set of skills – and in the case of the printing press – the flowering of knowledge that followed the public dissemination of scientific and literary ideas.

Social connections in a virtual world

> "Six degrees of separation between me and everyone else on this planet.
> But to find the right six people."
> John Guare, *Six Degrees of Separation* 1990

The online world is foremost a social world. Envisioned in the early 1960s as a "globally interconnected set of computers through which everyone could quickly access data and programs," the first conception of the internet was as a resource-sharing network that could be globally accessed by computer engineers (Leiner et al. 1997). But as is the way with technology, it developed in unanticipated directions, determined by the purposes for which it was ultimately employed. Literature examining online socialization in the past decade arrives at intriguingly contradictory conclusions: the internet is making us more individualistic; the internet is helping us stay part of extended family networks. The internet is making us more isolated; the internet is causing us to be more widely connected than we ever were before (Barabasi 2002). Increasing internet usage makes students distractible and difficult to teach; the internet provides marvellous opportunities for research, interactive learning and communication within groups. There are growing invasions of privacy as the use of social media expands (George 2006); social media may afford individuals their first real experience of "a genuinely private space" (Miller et al. 2016). Many of these paradoxes exist because of the malleable nature of the internet itself. As a medium of communication, it is constantly evolving as human needs shape it in a multitude of directions.

Footloose: adolescents on social media

In his seminal article, "Digital Natives Digital Immigrants," Mark Prensky (2001) described the children growing up at the time as "digital natives" and posited that they "think and process information fundamentally differently from their predecessors." The research and literature of the last decade is more nuanced and while it indicates shifts in the ways young people think and socialize, it also indicates that some things remain unchanged. Writing in 2007, boyd[2] describes MySpace, the social networking site then most popular with American teenagers, as "the civil society of teenage culture." Ahn (2011) writes that teenaged youths today are among the first generations that have grown up "surrounded by communication technologies" and goes on to quote a number of studies indicating that young people use new media for age-old activities: in effect, youth today are 'hanging out' on social networking sites, as they have done in the past outside schools, on road

sides, by shop corners and in cafes. Correspondingly, the apprehensions of parents and educators remain similar in tone to the fears expressed in earlier times. There are concerns about the amount of time adolescents are spending online, the impact of this virtual immersion on their behaviour and morality, and the risks they face as they journey alone in a dangerous world. Many 'digital immigrants' fear that adolescents are becoming narcissistic (Rosen 2007), disconnected from reality and are growing up in a world where relationships are shallow and the familiar boundaries of private and personal are increasingly unclear.

The personal becomes public

A prominent feature of social media is the affordance of communication *within* large groups of people, a phenomenon that has led to the unprecedented creation, selection and dissemination of information on a mass scale by 'ordinary' individuals, the proliferation of 'selfies' being a case in point. Baym (2010) writes that the ability to create and broadcast mediated content while interacting with the audience has blurred the boundaries between the public and personal. We are no longer just passive recipients of 'news;' we are simultaneously creators, disseminators and intended audience. In short, we *are* the news. Rosen (2007) writes scathingly of "the world of online social networking" and comments that "its users are committed to self-exposure."

boyd (2007) describes the three most common activities of teenagers on social media – the creation of profiles, inviting and accepting 'friends' and posting comments – as carried out in the public eye. She writes, "Friends are publicly articulated, profiles are publicly viewed, and comments are publicly visible." Examples of this mixing of the personal and the public abound as pictures of a recent birthday party get uploaded to Facebook, friendships and romances are broken in public and teenage angst and personal dilemmas are poured into video recordings that get uploaded to sites like Youtube.

There is also a 'social convergence' of different spheres of life on sites like Facebook (boyd 2008). In physical life, we may behave differently when going out with a group of friends, attending a class or having dinner with our family. On social media, different aspects of our lives tend to overlap and it can become much harder to delineate boundaries between the public and the personal. Nonetheless, boyd and Marwick's research (2011) points out that social network sites are inherently *public* spaces where private groups of teens may congregate, "the modern day equivalent of the mall or the movie theatre." In these public spaces, adolescents consistently make decisions about how much they wish to reveal and to whom. boyd and Marwick conclude that teenagers care about privacy (though with variations in their desire for levels of privacy) and accordingly create strategies to control information on social media and manage boundaries between different spheres of their lives.

Six degrees of separation

In the 1960s, researcher and psychologist, Stanley Milgram, theorized that we live in a 'small world' and are all "connected by six degrees of separation" (Watts 2004). The notion that the world is small and we are closely connected to unknown others has enduring appeal. In 2008, researchers at Microsoft announced the results of research that looked at 30 billion recorded online conversations carried out between 180 million people worldwide, coming to the conclusion that a chain of six to seven people will connect us to most people in the world.[3] In a digital age, where it is so much easier to connect with people notwithstanding geographical separation, one wonders whether the six to seven degrees of separation from one person to another will lessen, leading to a more closely connected world. The question that arises is whether the apparent connectedness of the world implies increasing *closeness* between people.

Studies from locations as diverse as Pakistan and the Netherlands indicate that adolescents spending significant time on social media can paradoxically have less interaction with their families (Saleem et al. 2015; Schols 2015). Sherry Turkle (2011) sees the internet as a place that gives us "new kinds of spaces" where we come together, but stay alone. In her book, *Alone together: Why We Expect More from Technology and Less from Each Other*, she explores human interaction on the net and finds that as we connect more frequently and with more people, we avoid communication tools that require us to have real time conversations, such as the telephone. Younger people, in particular, prefer instant messaging apps like Whatsapp and instant messaging on Skype. Turkle quotes a shy sixteen year old who constantly uses her phone for texting, but does everything she can to avoid phone calls: "When you instant-message you can cross things out, edit what you say, block a person, or sign off. A phone conversation is a lot of pressure. You're always expected to uphold it, to keep it going, and that's too much pressure." Turkle believes that our increasing presence on social media underlines our increasing aloneness.

Rainie and Wellman (2012) take a different view. In a commentary on their book *Networked: The New Social Operating System*, they write, "Our evidence is that these (virtual, online) technologies are not isolated — or isolating — systems. They are being incorporated into people's social lives much like their predecessors were." Nonetheless, they agree that the *ways* in which people interact are changing. They tend to agree with Turkle that people are networking increasingly as individuals rather than members of communities, a phenomenon they call "networked individualism." They write: "In the world of networked individuals, it is the person who is the focus: more than the family, the work unit, the neighbourhood, and the social group."

In contrast, Miller et al's (2016) research in different countries shows that people use the internet for a variety of reasons, one of which is to stay connected to social groups, such as families and friends, and network within their own communities. Particularly, in the more traditional societies where some of their research was

conducted, social media provided communities an additional tool to connect with others on issues of common interest. An important thread in current research is the finding that while people use social media networks to communicate widely with unknown others, they also use social media much as they used earlier communication technologies: to further *existing* patterns of socialization and strengthen relational networks that they are already embedded in. Miller et al. found that the 'friends' on mediums like Facebook were often one's own family or friends and acquaintances in physical life. Ahn (2011) corroborates that in common with adults, adolescents aged 12 to 18 years on Facebook largely socialized with people they *already* knew. Ellison, Steinfield and Lampe (2007) also believe that most young people use social media to connect with people they already know in the offline world. Their Facebook research indicated that even those online connections that adolescents identified as "weak ties" were often connected to them through their offline friends: friends of friends of friends who were reached through the chains of six or seven degrees that ultimately lead us to all others.

How many friends are really friends?

The journal *Ethics and Information Technology* published a special edition analysing the obstacles to forming online relationships that met Aristotelian criteria of real friendship (Cocking et al. 2012). Worries about the counterfeit nature of online friendships have been compounded by social media sites appropriating words like 'friends' and 'followers' and using them in ways that alter long-established meanings (boyd and Ellison 2007). An awe evoking feature of internet usage has been the *number* of 'friends' and 'followers' that a person can have on social media sites. Anthropologist, Robin Dunbar (1993), theorized that our social groups number around a hundred and fifty people, on average. Within this number, we have smaller circles of more intimate relationships, and surrounding it, larger circles of up to fifteen hundred people who we recognize socially and can give a name to. With the growth of online social interaction and the dramatic increase in the number of people we 'friend' and 'follow', critics fear that Dunbar's number will no longer apply. Ironically, we may find ourselves socially exhausted and disconnected from our traditional social groups (Konnikova 2014).

Kaliarnta (2016) counters the critique of online friendships, writing that is based on "inconsistencies and fallacies." Others provide evidence that despite the mind-boggling numbers of people who can be 'friends' and followers on social media, human patterns of socialization remain essentially the same: In a study on the social media site Twitter, Goncalves et al. (2011) discovered that people could not maintain more than a hundred to two hundred stable connections. Similarly, in a study on Facebook usage by American undergraduates, Ellison et al. (2011) discovered that while the average number of people the students had 'friended' were three hundred, the people they counted as *friends* were no more than seventy-five. boyd (2006) writes that the traditional use of the word 'friend' "is meant to signal a certain kind of relationship" but 'friending' online is really a process of creating community and deciding who will have access to our online space and in what

measure. Based on her research, boyd concludes that young people on social media understand the different connotations of 'friending' and friendship.

The dark side of online socialization

While social media sites are largely used for connecting with others, there is a definite downside that accompanies our ability to travel online and access others. A number of studies have documented that the sense of distance, anonymity and invisibility afforded by online transactions, in combination with the lack of visible authority results in disinhibition (Suler 2004). The rise of virtual media has seen a corresponding rise in the possibilities for self-projection and the phenomena of cyberbullying (Nixon 2014; Aricak et al. 2008), online witch hunts and group hysteria.

A number of studies on cyberbullying show that while perpetrators have moved beyond the "schoolyard" into the online realm, bullying as a phenomenon remains unchanged, with familiar motivations accompanying it (Li 2007; Patchin and Hinduja 2006). Bullying in the physical world takes its toll of the victim but the cyberbully has many more weapons added to his arsenal, particularly, the ease with which he or she can access the victim round the clock and circulate abusive images and material. The fact that electronic data almost never goes away has an especially detrimental impact on victims' levels of self-esteem (Patchin and Hinduja 2010).

Bullying takes on a new dimension when it assumes the proportions of an online witch hunt in which large groups participate (BBC 2013). Baym (2007) writes that social media users "have increasing influence in shaping the phenomena around which they organize." Urban legends, memes and defamatory information spread rapidly through networks, taking different shapes and sometimes resulting in group hysteria. The interlinked structure of online social networks leads to 'information cascades' (Bikhchandani et al. 1992) accompanied by the rapid "diffusion" of emotion (Steiglitz and Dang-Xuan 2013).

Virtual versus real

Early literature on the internet grappled with the seeming fragmentation of identity between daily life and virtual spaces such as the fantasy worlds provided in multiplayer games (Turkle 1994). The apparently dichotic nature of online engagement and real-time presence raised concerns about *where* reality was located (Heim 1991). The Web was a virtual space but it was embodied by real people and the online representations they gave themselves – their avatars in games or the identities they created on social media. The highly absorbing nature of online engagement became apparent early on and the term "internet addiction" entered popular parlance with CNN predicting that this new trend was "creating a society of on-line addicts" (Young 1998). At the same time, developments in augmented[4] and virtual reality (VR) technologies promised experiences that would be progressively more immersive,[5] 'real' and three dimensional. Critics feared that young people would spend increasing amounts of time in virtual worlds that were by definition,

unreal. Subrahmanyam et al. (2001) wrote that there may be a "blurring" of the lines between "reality and virtual reality" as adolescents interacted with online 'bots' and handled virtual pets.

The literature of the past two decades has strongly countered the view of the online and offline as divided into 'real' and 'unreal' worlds (Lehdonvirta 2010; Valentine and Holloway 2002). Miller et al. (2016) write that "the online is just as real as the offline," implying that both are part of the same reality. But do our actions have the same moral implications in the online and offline worlds? Jennifer Haley's play, *The Nether*, is a troubling foray into a future where people experience life mostly through an evolved version of the internet. In this world, a paedophile creates a site where the avatars of site users can meet virtual children and perform horrific acts of abuse and killing. Haley's dark, disturbing play raises questions about the moral neutrality of virtual acts, an issue that becomes particularly important in the context of online gaming and augmented[6] and virtual[7] reality (VR) experiences (Brey 1999).

VR technology promises tremendous educational advantages by allowing people to access places and experiences that they would not otherwise have. For schools, the possible benefits are tremendous, offering students immersive experiences in history, geography, literature and other subjects. However, there are very real concerns about the impact on adolescents when immersive experiences mimic acts that would be reprehensible in real life, for instance in digital games that feature violence, warfare and killing (Persky and Blascovich 2007). An example is the VR version of the popular game Grand Theft Auto[8] in which players can enter a three dimensional environment by wearing a head set and virtually perform acts of violence and killing. According to Persky and Blascovich, there are some indications from research that feelings of aggression increase in players engaged in violent VR games.

It is difficult to gauge the ultimate consequences of our increasing absorption in the virtual realm and our access to digital simulations of experiences that previously required physical presence and contact. Occasional stories of people 'hooked' on to social media and dysfunctional parents who let their offspring starve while tending to virtual children make dramatic headlines in news media.[9] However, there is no evidence that the problem lies in technology and not in the personalities of the protagonists. There is some research showing that the time spent by adolescents on virtual media lessens their interaction with their families (Wallace 2014) but the story of virtual technology is still unfolding. Future longitudinal research may provide a fuller picture of adolescent interface with social and natural worlds, mediated through electronic devices.

Two conversations

Questions relating to the topics of this paper were piloted on two small focus groups; one comprising three adolescents, the other consisting of four parents of adolescents aged twelve to eighteen years. The themes emerging from the two separate discussions are discussed concurrently.

The three young adolescents were thirteen year old boys, grade eight students in a well-known school of Karachi where the medium of education is English. Although the number of participants was too small to be representative of a greater population they shared commonalities with other children belonging to the same socio-economic stratum. They were on social media sites, regularly played online games and had their own personal devices through which they could access the internet and browse the Web.

The four parents worked for a large organisation in Karachi but were positioned at very different levels within the hierarchy of the institution. Two of the parents were men, professionals hailing from economically secure backgrounds and placed on higher echelons of authority within the organisation. The other two were women working in secretarial positions who came from less affluent backgrounds. All four had one or more adolescent offspring between the ages of twelve to eighteen years. Notwithstanding the difference in their financial status, all four had provided their children with computers – and to the extent that they could afford – other electronic devices for communication.

Virtual access and control

The struggle to regulate the amount of time spent online by adolescents was a familiar theme that ran through the discussion with the four parents. Three of them were resigned to the amount of time their children spent online: "All day, every day," as one parent put it. Another remarked, "From the time he wakes up to the time he sleeps." One parent whose son was twelve and just entering adolescence still managed to limit the time for computer use and online browsing. The other parents believed that it had been easier to regulate the use of electronic devices when their children were younger. As they went through their teens, it became increasingly difficult to limit their use of computers and other devices. Instead, parents came up with strategies such as insisting on their children's presence at meal times and mandating the completion of homework in order to use their devices. Some of their comments echoed studies showing that increasing time spent by adolescents in virtual engagement lessened the amount of time spent interacting with their families. One parent commented that face to face interaction with adolescent children no longer happened automatically. He added with perspicacity that opportunities for talking to their children had to be *created* and built into their days. One of the women recounted nostalgically that her two older children had spent a lot of time with her and their father. She felt that her youngest son, the first in the family to grow up with a computer, was more independent and less "connected."

For the three adolescent boys, online access was an extremely important facet of their lives. They related stories about their parents' varying struggles to limit the time they spent online, humorously recounting incidents of parental oversight which allowed them to play and browse through the day. Their descriptions of their online activities were reminiscent of boyd's research indicating that the Web was a *space*, a public meeting area where adolescents could 'hang out' and meet up with other

young people. Much like the teenagers of old, they escaped into the virtual streets of the online world to gather, play and hear the latest gossip.

Socializing on the Web

The parents generally saw social media sites as furthering communication and social activity rather than disconnecting users from traditional social networks. One parent remarked that he did not think that adolescents were becoming more individualistic and self-centred: in fact, he was of the opinion that they were "very connected." He described how his child's social groups came together to try and solve local problems, for instance, when someone uploaded the picture of a sick child needing financial help. All the parents thought that their children mostly socialized with people they knew in daily life. Some of the adolescents used social media sites to meet friends while one parent said that her son and his friends set up 'play dates' and teamed up on multiplayer games after school. The parents believed that their children did not socialize with completely unconnected strangers on the Web.

Miller et al. (2016) discovered that people use social media in different ways to communicate with people they placed at different levels of intimacy. The online activity of the three adolescent boys conformed to Miller et al's ideas about 'sociality' and they skilfully used different social platforms to communicate with different people. All three were on social media sites like Facebook and though their level of activity varied, their contacts on Facebook were family, friends, and in some cases, friends of friends. All three used multiplayer game sites and YouTube as places to socialise in a different way: they explained that multiplayer games were much more competitive and "fun" because they could play against real people instead of 'bots'. They elaborated that some games have clans and groups but in others, players "use their own ideas and team up." They chatted with other players but cautiously restricted their talk to the game or the game-site. One boy explained: "You don't want to express too much or they'll make fun of you." The boys were well-aware that fellow members of clans and teams could only be temporary friends. One commented, "Sometimes we chat for a few days and then they disappear. I wonder if they are okay."

The three boys displayed an understanding of the many shades of meaning given to the word 'friend' in its contemporary forms. Defining a 'real friend' one said, "A person I know who plays with me, spends time with me." Another boy added, "You know them really well in real life. You talk with them and have a really close relationship with them." The boys were of the opinion that Facebook 'friends' were not all real friends according to the definition they had given. "Some people on Facebook are friends," remarked one, "Others are people you don't really know well."

The boys used gaming sites to meet friends from daily life and play together. At the same time, these sites offered greater opportunities to get to know strangers: two of them had online friends from gaming forums whom they had never seen but with whom they occasionally did voice chat. Even so, adult fears of predators had seeped

into their consciousness and they emphasized that they did not reveal their identities online. One boy said about his online friend, "He seems really nice but I don't know. I can only say what I think."

The three boys followed video channels (vlogs) for entertainment and a different level of sociality. "People comment," one said perceptively, "but it's not really a conversation. People mostly say (nasty) things about each other." Discussing the disinhibition that results from anonymous interaction, he gave the example of a recent comment that became a meme, "Drink bleach. Kill yourself."

Reality and virtual immersion

The four parents generally saw virtual technology as giving an advantage to their children. They also felt it to be an inescapable part of contemporary existence. "They have the whole world in their palm," exclaimed one parent, "they have many more choices." "It's a part of their lives," said another, "Even their homework is online." They were concerned that their children had less face to face contact with others, but on the whole, their worries were pragmatic rather than philosophical: "They have become couch potatoes," one parent remarked. "These children play but they don't need to go out to play. The weather makes no difference. They can play with anyone in the world."

The four adults did not see any real problems connected to immersive technology, but interestingly, the three adolescents had reservations about VR and augmented reality. Discussing the new wave of VR games they expressed concerns about playing games that incorporated violence. One boy remarked, "Killing and racism, this should not be VR." Another boy commented, "You'll feel like you've killed someone in real life."

The three boys had mixed feelings about the authenticity of VR experiences of physical settings, such as a walk around a city or a dive into the sea. One thought that the ability to experience something without ever having gone there would "make you lazy." Another boy felt that the experience would be realistic but not real. He explained, "It would be the way you *want* it to be. It's artificial, it's just not real. It would be a learning experience, but it would take all your interest out of the real thing." The third boy added, "It may seem real but your heart knows that it isn't real."

Conclusion

The Cambridge Dictionary defines the word immersive as: "seeming to surround the audience, player, etc. so that they feel completely involved in something."[10] The title of this paper uses the word immersive in multiple senses: to indicate that virtual experiences tend to absorb individuals deeply as well as in reference to immersive technology. In the past decade, our ability to interact with virtual technology has changed dramatically: human engagement has essentially refashioned the Web into a social engine on which people continue to do what they have done

through the ages – gossip, chat, get to know new people, connect with family and meet up in groups and communities. On social media sites, human consideration influences what gets read and seen, affecting the ways in which news, information and issues of social import are transmitted and interpreted. Simultaneously, the time we spend online has increased substantially and online transactions have largely replaced other forms of communication including letter writing, telephone calls and face to face meetings. As more and more aspects of daily living are 'uploaded' we become more deeply immersed in the online world. For adolescents, the possible consequences of this immersion are diminished interaction with family and decreasing interface with the physical world. Simultaneously, the Web offers tremendous opportunities for connecting with friends and relatives and becoming part of online social groups. Online spaces are the new hang-outs and most teenagers seem adept at managing the confluence of private and public circles of sociality in these spaces. They are also skilful at assigning degrees of closeness to online contacts and deciding what to reveal to them.

Extensive research has been done on human behaviour online but so far the findings are not conclusive. An earlier stream of research reflects the fears and moral panic that inevitably seem to accompany new technologies. A more contemporary stream of research and writing reveals a process of normalisation underway: innovations in technology disrupt existing patterns of communicating because of the new 'affordances' they provide. With the passage of time, new patterns emerge which gradually become invisible and are taken for granted. The question remains whether in this process of becoming ubiquitous and invisible, new patterns of communication mask more significant changes in human behaviour. Historically, we have moved from meeting in the flesh to written communication and from written to print. Each of these has changed the ways we communicate and the smallest shifts in behaviour may have had deep, unpredicted impacts on the ways in which we think. Socrates believed that humans would lose some essential qualities as the teaching of philosophy became a written rather than oral discourse. In recent times, letter-writing is a lost art, long replaced by the brevity and ephemeral nature of Snapchat. Will adolescents lose their humanity if they no longer write thoughtful missives? The answer is not so certain. Longitudinal research in the coming decades will reveal more about the long-term consequences of growing up immersed in a virtual world.

Notes

[1] Pokemon Go is an augmented reality game that uses GPS tracking to display a player's actual physical location as the background for the game.

[2] danah boyd prefers not to capitalize the letters beginning her name.

[3] Reported by Duncan Smith in *The Guardian* in 2008, available at: https://www.theguardian.com/technology/2008/aug/03/internet.email

[4] In which digital images are superimposed on real or realistic settings

[5] Virtual reality (VR) is called Immersive in the sense that users feel themselves to be a part of the virtual experience

6 In augmented reality, digital images appear superimposed on real locations, as in Pokemon Go and other games under development.

7 Virtual reality offers a three dimensional experience of a game or a realistic or fantasy setting through headgear like Google Cardboard or Oculus Rift. The user feels 'immersed' within the virtual environment.

8 http://grandtheftvr.com/

9 Reported by Tran M. in *The Guardian* in 2010, available at:
https://www.theguardian.com/world/2010/mar/05/korean-girl-starved-online-game

10 Definition of "immersive" from the Cambridge Advanced Learner's Dictionary & Thesaurus © Cambridge University Press

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MICHAEL SPIES

CHANGING ASSEMBLAGES OF HIGH MOUNTAIN FARMING IN GILGIT-BALTISTAN

Abstract

Theories of agricultural change often fail to grasp the complexity of farming dynamics by narrowly postulating a dominant driver of change (e.g. population growth or externally-induced innovations). In a similar manner, debates about environmental or climate change often tend to follow a reductionist perspective on agricultural systems by elevating climate (or the 'natural' environment) to the prime determinant of (future) change. This paper follows a different perspective. In a case study on high mountain irrigation agriculture in Nagar District, Gilgit-Baltistan, I draw on ideas from assemblage and actor-network theories to apply a more balanced analytical framework on agricultural change. Irrigation agriculture is conceptualised as a complex and dynamic 'assemblage' of diverse social and natural, material and immaterial, small-scale and large-scale, and local and external components. These heterogeneous actors and elements – or 'actants' – actively engage with each other, while none of them fully determines another: all kinds of actants can be considered as equally valid drivers of agricultural change. Based on this conceptual framework, the paper describes how in recent decades, irrigation agriculture in this high mountain environment has transformed from an already sophisticated endeavour of subsistence farming to an increasingly complex socionatural assemblage that involves a variety of new local and external actants. In the arid to semi-arid environment of the populated valleys, crop production relies on the utilisation of glacier melt water through channel networks that have evolved over centuries. Until the 1980s, farming was mainly subsistence-oriented and modern technologies were largely absent, with dominant crops being wheat, barley, millets, buckwheat, maize, alfalfa, and apricots. Over the last three decades, new technologies have been adopted, traditional crops have been replaced by potatoes and other cash crops, and agriculture has lost significant importance in the diversified livelihoods of the village population. At the same time, local changes in the physical environment have partially altered the usage of land and water resources. The village of Minapin is selected as an exemplary case for the changes that occurred in this region. While describing the dominant changes in local irrigation agriculture since the 1980s, the paper draws attention to the active roles of various human and nonhuman actants. Rather than postulating any 'underlying' driver of change, the paper identifies roughly four different groups of actants that have played major roles: (1) local activists and the Aga Khan Rural Support Programme, (2) traders and agricultural markets, (3) education, new ideas and off-farm income opportunities, and (4) infrastructure and the physical environment. The paper concludes that only when the various roles of these heterogeneous actants are properly mapped out, conclusions about the relevance to broader socionatural processes such as economic development, social change, and environmental or climate change can be drawn.

Introduction: the limits of agricultural change theories and the need for an integrated approach

The second half of the twentieth century brought a variety of theories that ought to explain agricultural change. A widely-recognised theory was formulated by Ester Boserup (1965): in simplified terms, she argues that population pressure leads to agricultural intensification, i.e. to an autonomous process of reduced fallowing and agricultural innovation (Boserup 1965; see also Stone 2001: 330–31). Although her model was popular among many scholars and agricultural extensionists, it later received much criticism for its over-simplifications and its neglect of socio-cultural, political-economic, and ecological variation (Datoo 1978; Brookfield 2001; Stone 2001).

Other influential theories of agricultural change emerged in connection with economic modernisation theories such as the 'stages of growth' theory by Walt W. Rostow (1990). Regarding historical developments in Western countries as the ultimate pathway for countries of the Global South, these approaches postulate that agricultural transformations follow an 'ideal' trajectory from subsistence-oriented practices to a highly commercial and technologically 'advanced' enterprise (see e.g. Timmer 1988). Such thinking has shaped the so-called Green Revolution, where international organisations, governments, and many other actors pushed a modernisation of agriculture that was believed to be part of an "inevitable process" (Peet and Hartwick 2009: 132) necessary for the Global South to gain prosperity. However, empirical evidence has shown that the Green Revolution has led to many negative social and environmental consequences, and that modernisation approaches to agricultural change often neglect social and environmental factors that are crucial for understanding developments on the local or regional scale (cf. Timmer 1988: 283–84; Brookfield 2001: 218ff.; Glaeser 2010).

In contrast, scholars like Paul Richards (1985) argue that the main drivers of agricultural change are the farmers themselves. Criticising the implicit assumption in modernisation approaches that local farmers are mere recipients of scientific innovations from more 'advanced' centres (esp. the West), they argue that "[f]armers will almost always take a broader view of the implications of technical change than scientists" by evaluating aspects such as "access to inputs, risk, market relations, food processing, storage and use" (Chambers and Ghildyal 1985: 113). Yet, it must be considered that farmers are never fully independent in their decisions – an overemphasis of their agency can lead to a neglect of political-economic or other structural constraints.

Somewhat apart from these debates are more recent conceptualisations of agricultural change in the context of climate or environmental change. Here, a new factor that has largely been neglected by the above-mentioned approaches is regarded as a major determinant of (future) agricultural developments: the climate or, more broadly, the 'natural' environment (see e.g. Mendelsohn 2007; Maharjan and Joshi 2013; IPCC 2014). However, at least to some extent, these debates seem to follow a rather narrow perspective on human–climate relations that has been criticised earlier for its

environmental reductionism or determinism (cf. Hulme 2011; Nielsen and Sejersen 2012; Spies 2016). While these criticisms have partially been accounted for in the last IPCC report, for instance,[1] recent work related to climate change in the upper Indus basin continues to pursue reductionist viewpoints (see e.g. Prichard et al. 2017).

All these perspectives on agricultural change have in common a certain overemphasis of one driver (or type of driver) of change, while downplaying or neglecting others. In this paper, I want to demonstrate an analytical approach that tries to reconcile these (and possibly other) opposing perspectives by acknowledging all kinds of factors and actors as equally valid drivers of agricultural change: the 'assemblage' approach. I will follow this approach in a village case study on the multifaceted transformations of high mountain irrigation agriculture in Nagar, Gilgit-Baltistan. In recent decades, irrigation agriculture in this area has transformed from an already sophisticated endeavour of subsistence farming to an increasingly complex socionatural assemblage that involves a variety of new local and external (f)actors. The assemblage approach tries to take into account the active roles of diverse social and 'natural', material and immaterial, small-scale and large-scale, and local and external actors and elements in a symmetrical way – without postulating any underlying force, any ultimate pathway, or any "mysterious structure" that unicausally determines the outcome (Latour 2005: 179; Anderson and McFarlane 2011). These actors and elements – or 'actants' – actively engage with each other, while none of them fully determines another: all kinds of actants can be considered as equally valid drivers of agricultural change. In short, every actant is in principle able to affect another, it always depends on their specific constellation in a unique and singular assemblage (cf. DeLanda 2006: 26–46). Irrigation agriculture in the high mountains of the Karakoram is thus conceptualized as a complex assemblage of components as diverse as mountain terraces, glaciers, climate, irrigation channels, soils, crops, fertilisers, village communities, individual farmers, practices, tools, institutions, markets, businessmen, and many other human and non-human elements.

High mountain irrigation agriculture in the Hunza-Nagar valley

The Hunza-Nagar valley is located in the western part of the Karakoram, one of the world's highest and most heavily glaciated mountain ranges. In political terms, this area is part of Gilgit-Baltistan, a semi-autonomous region administered by Pakistan. The valley is divided into the two districts and former princely states of Hunza and Nagar, separated for the most part by the deep ravine of a major river (see Figure 2). Today, the combined population of Hunza and Nagar is estimated at 148,000 people (Government of Gilgit-Baltistan 2013). The villages and agricultural fields are located in the valley bottoms at elevations between 1900 and 3100 m.a.s.l. While the populated areas are characterised by a semi-arid to arid climate, there is much snowfall in higher elevations. In the absence of long-term data, scientists estimate an annual precipitation of more than 1000 mm in the glacier source areas above 4000–5000 m.a.s.l. (Hewitt 2014: 1, 19–21, 87).
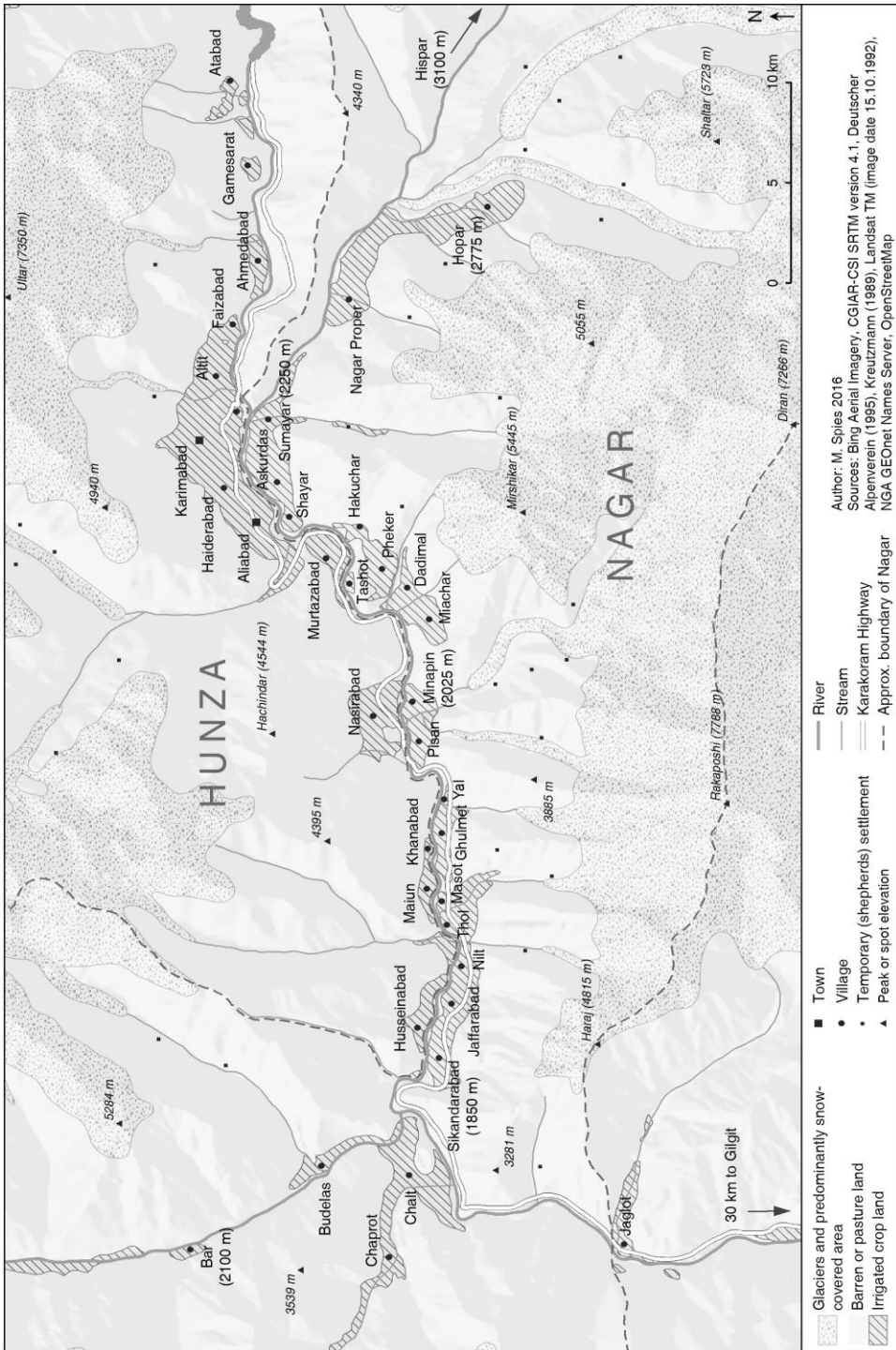
Figure 1: Nagar and Lower Hunza in Gilgit-Baltistan (Minapin village is located in the centre of the map)

Therefore, crop production relies on the utilisation of melt water from glaciers and snowfields in higher areas. Irrigation water is distributed to the fields through sophisticated channel networks that have evolved through the engagement of several generations of farmers with the dynamic biophysical environment. While some villages – e.g. Minapin, Pisan, and Bar in Nagar – have abundant water available, in other settlements – most of Hunza and villages like Sikanderabad, Shayar, and Pheker in Nagar (see Figure 2) – water is scarce and farmers have to abide by strict regulations of water access. Until the 1980s, dominant crops were wheat, barley, millets, buckwheat, maize, alfalfa, and apricots, but they are increasingly replaced by potatoes and other cash crops (see also Sökefeld 2012). Crop production is complemented by animal husbandry (mainly sheep, goats, and cattle) with seasonal use of high pastures – there are strong inter-linkages between these two components that form a "combined mountain agriculture" (Ehlers and Kreutzmann 2000: 17). Hunza and Nagar have been subject to substantial and multifaceted changes in recent decades, affecting not only the agricultural sector but also infrastructure, livelihoods, and local politics, among others. A number of studies have investigated these changes and their social effects in Hunza (e.g. Benz 2016; Kreutzmann 2006), but little is known about the situation in Nagar, where research has been largely absent since the 1980s (see Butz 1987; Frembgen 1985). Recent developments in agriculture are shaped by a dynamic context that differs from village to village, among others depending on elements of the local environment, on local organisational and institutional patterns, and on influential local leaders and activists. One example to be elaborated more in detail is the village of Minapin in Nagar.

The empirical data on which the following is based was collected during about ten months of field work between 2014 and 2016. Methods included participatory observations, repeat photography of pictures from the 1980s, and numerous semi-structured interviews and discussions with local informants such as elder farmers, community activists, village heads and NGO workers. Local assistants played invaluable roles as guides and interpreters.

Case study Minapin, Nagar: mapping the actors and elements of agricultural change

From the perspective of development organisations, Minapin has been a 'model' village in the relatively conservative Twelver Shia community of Nagar, where activities by external development agencies have sometimes been been met with much reservation. In the 1970s, the princely micro-state of Nagar was dissolved, the Karakoram Highway that runs through the valley was completed, and the formerly very isolated mountain community became connected to downcountry Pakistan. In the early 1980s, the Aga Khan Rural Support Programme (AKRSP) started their development activities in Nagar in the fields of agriculture, infrastructure, education and other fields related to livelihoods and health. Their activities were at their peak in the 1980s and 1990s, but AKRSP remains the most prominent non-governmental development organisation in the area until today. Meanwhile, government institutions and programmes have become central development actors in the region.

Minapin is a relatively resource-rich village of about 210–220 households, with exclusive access to the melt water of a large glacier and with abundant pasture resources in higher areas. However, cropland is relatively scarce, as the village is bounded between two rivers and a mountain slope.

In the following, I will outline the various changes that have shaped irrigation agriculture in Minapin in recent decades, structured into four brief sections. Each section focuses on different actors and elements of change that have played major roles: (1) local activists and AKRSP, (2) traders and agricultural markets, (3) education, new ideas and off-farm income opportunities, and (4) infrastructure and the physical environment. There are other important actants as well, but for the sake of conciseness they are not discussed in this paper.

Local activists and AKRSP

In the late 1960s and early 1970s, Minapin had been a centre of the successful resistance movement against the Mir of Nagar, and an important leader of the movement was from this village: Syed Yahyah Shah. In the 1980s, Yahyah Shah and other social activists from Minapin were among the first men in Nagar to cooperate with AKRSP – against the will of local religious leaders and other people who, among others, feared to lose in authority if 'Western' development ideas spread in the community. There were also persistent rumours that AKRSP would pursue a secret agenda of converting the people of Nagar to Ismaili Islam, the religion followed by the majority of the population of neighbouring Hunza.

Thus, local activists in Minapin started to cooperate rather secretly with AKRSP, and experimented on their lands with new varieties of wheat provided by AKRSP, with chemical fertiliser, and with new vegetable seeds. When they demonstrated substantial improvements in yields, other villagers increasingly accepted to cooperate with AKRSP, which required the formation of a 'Village Organisation' with a certain structure. Largely initiated by Yahyah Shah, new varieties of apple and cherry trees were also introduced in Minapin, among others through the establishment of a local tree nursery financed by AKRSP. In the 1980s and 1990s, Yahyah Shah actively promoted his ideas of sustainable agricultural improvements in all parts of Nagar – which, among others, included the adoption of new fruit crops, but also the expansion of the traditional and locally adapted apricot trees. Since then, fruit production has expanded considerably in Minapin, with most households gaining some income from selling fresh and dried fruits. Overall, AKRSP triggered substantial changes in local agriculture, but the efforts of Yahyah Shah and other local activists to promote new ideas and to convince people of the benefits of cultivating new crops must be considered at least equally important.

Traders and markets

When asking farmers in Minapin about the dominant field crops in the 1980s and today, the most striking difference they mention is the increase in potato

production. While until the 1980s, potatoes were planted in small plots for local consumption, today most households cultivate about half of their cropland with potatoes for sale in downcountry. Many actors and elements were involved in causing this change: among others, the supply of highly government-subsidised wheat from downcountry Pakistan – introduced already by Zulfikar Ali Bhutto in the 1970s – has gradually increased, motivating farmers to turn to the considerably higher-yielding production of potatoes. While development organisations tried to foster potato cultivation in this area already in the mid-1980s, the main turning point occurred in the late 1980s or early 1990s: Jaffer Brothers, a trading company based in Karachi, approached the village and introduced new potato seeds, trained local farmers, supplied them with chemical fertiliser and bought their potato harvest on contract basis. When they wound up their activities in the area a few years later, the farmers of Minapin had become aware of the new techniques and of the profitability of potato production. Other local and external traders emerged who started to buy the potato harvest from the villagers. Today, most farmers in Minapin sell their potato harvest to local businessmen from Minapin and its neighbouring village Pisan, who in turn sell the product at the main fruit and vegetable market *(Sabzi Mandi)* in Islamabad.

While Jaffer Brothers and individual traders played important roles in the upswing of potato farming in the 1990s, locals also report that the prices for potatoes increased around that time – probably as a result of increased market demand, but also due to improved road access and reduced transport costs. In recent years, market dynamics have also played a central role in changes related to fruit production: in particular the demand for cherries has increased substantially, while the potato price has been subject to heavy fluctuations. Changes in market demand and access are major reasons why farmers have recently planted many new cherry and other fruit trees in the cropland of Minapin (see Figure 2).

Figure 2: Minapin village during apricot blossom in April 2015

Education, new ideas and off-farm income opportunities

Overall, the number of fruit trees in Minapin – mainly apricot, apple, cherry and walnut trees – has at least doubled in recent decades, as a comparison of photographs from the 1980s with the current situation reveals. Although AKRSP, local activists, traders and market dynamics have played crucial roles, developments in the off-farm sector are equally important for understanding these and other changes in agricultural practices.

First, a considerably uplift of education in Nagar and new cultural influences from downcountry Pakistan have led to changes in traditional values and ideas. Among others, this has reduced the traditional notion that orchards are less valuable than arable land, and people increasingly acknowledge the economic benefit of investing in fruit production. At the same time, elders often complain that younger generations are losing interest in agriculture, instead looking for employment in the region as well as in downcountry Pakistan. As a result, a loss of local agricultural knowledge occurs, and people put less efforts in properly preparing and irrigating the fields, among others.

Second, education – most boys and girls are now visiting schools, and many strive for higher education – and off-farm work in the government and private sectors have led to a lack of workforce in agriculture. Even though land holdings per household have become considerably smaller as a result of population growth, farmers complain that it becomes increasingly difficult to find family members who have time to take care of the land. Paid labour is uncommon and usually too expensive. This lack of workforce is an important reason why people increasingly invest in the considerably less labour-intense fruit production. But there are other effects as well: the number of animals has decreased in recent decades because it has become more and more difficult to find young men to work as shepherds in summer. As a result, the supply of animal manure has declined, and farmers notice a reduction in soil quality due to the increased usage of chemical fertiliser. They argue that the soil is becoming "harder" and "addicted to nitrophos [chemical fertiliser]".

Infrastructure and the 'natural' environment

Although I have so far bracketed them out, elements of the physical environment – including physical infrastructure and the 'natural' environment – have played important roles in the agricultural changes observed in Minapin as well.

In particular, the construction of the Karakoram Highway must be seen as the infrastructural precondition for the boost in trade between this high mountain region and downcountry Pakistan. Significant improvements of this road also played a part in the recent increase in cherry production in Nagar, as the transport time is important for this highly perishable fruit: cherries are carefully packed in small boxes and transported overnight to markets in downcountry Pakistan, where they are usually sold the next day. New link roads have also made a difference. While until

the early 1990s, only jeeps and pick-up trucks could reach Minapin, a new metalled road has significantly reduced transport costs for potatoes as the village is now accessible by large trucks.

While there are big differences from village to village, changes in the local environment can also significantly influence agricultural developments in this dynamic high mountain area. In Minapin, glacier changes have considerably altered agricultural land use in the past: due to melting of the glacier tongue, the water channel that irrigated large areas of slopy cropland above the village went dry in the early 1970s. This land had been an important resource for producing fodder crops (especially alfalfa) for the livestock of the village, so farmers now had to buy fodder from neighbouring villages and to cultivate alfalfa on the limited cropland of the village terrace (see Figure 2). However, in the 1990s some local activists initiated an extraordinary adaptation project to reirrigate the barren land: with the help of funds provided by AKRSP and a local government institution, the village community built a new pipe irrigation scheme to transport water from a distant melt water stream across a deep ravine. Since 1994, the slopes above Minapin are cultivated again and the cropland could even be extended. There is a risk that the small melt water stream disappears in the near future due to ongoing retreat of the glacier – but villagers are already making plans to tap an alternative water source that would emerge if the glacier further retreated. The effects of glacier changes on irrigation agriculture are generally complex. Examples of the damaging effects of both advancing and retreating glaciers can be found throughout this mountain area. Besides glaciers changes, landslides and other mass movements have played important roles in agricultural dynamics as well: Some farmers of Minapin, for instance, have agricultural land in an adjacent area called Murku. Due to recurring destructions of the main irrigation channel on a steep landslide-prone slope, Murku has been subject to severe crop failures in recent years. As the landslides are not likely to stop in the near future, farmers might have to abandon this land – many of the fields are already left barren.

Conclusions

It has been shown that agricultural change in this dynamic socionatural environment cannot be sufficiently explained by the reductionist theoretical approaches mentioned in the introduction of this paper. Too many actors and elements are at play, and they interact in very complex ways. In a case study of the village of Minapin, I tried to provide a glimpse of the diversity of actants that shaped the developments in local agriculture in recent decades. There are, of course, many aspects of change and many related actants that I neglected here. However, the objective of this case study is not offer an exhaustive description, but to provide an idea about the heterogeneity of actors and elements involved in local agricultural change.

While the empirical insights from the case study cannot be generalised – the situation is too different from region to region, or even from village to village –, I want to offer some reflections on the analytical approach. The assemblage approach

outlined here promotes a thoroughly inductive research design: conclusions should only be made on the basis of empirical observations, not on general assumptions. This implies a bottom-up rather than a top-down perspective when trying to link local agricultural dynamics to changes in the wider context. It makes sense to begin with empirical observations on the ground, before 'following' the actants (Latour 2005: 12) to investigate their sometimes very unexpected relations to other elements and processes of the socionatural environment. Depending on how broad the research questions are formulated, researchers should keep an open mind to all kinds of actants, because they can all make a difference in the changes observed. Only when their various roles are properly mapped out, conclusions about the relevance of broader processes such as economic development, social change, and environmental or climate change can be drawn. To be sure, some actants are always more powerful than others, and certain 'structural' patterns can have a strong effect on the ways in which relations unfold. These structural patterns, however, should not be taken for granted: they are themselves assemblages, historically emerging through the interactions of a diversity of actants.

Acknowledgements

Notes

1 See the changes in the conceptualisations of "adaptation" in IPCC (2007: 869) and IPCC (2014: 1).

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AMNA TANWEER YAZDANI AND NOSHEEN ALI

SEED POLICY IN PAKISTAN: THE IMPACT OF NEW LAWS ON FOOD SOVEREIGNTY AND SUSTAINABLE DEVELOPMENT

Abstract

This paper highlights the challenges that genetically modified (GM) seeds pose for farmers, citizens and the land itself in Pakistan. It explores the history of agricultural policy in Pakistan from the Green Revolution to what is now being dubbed the "Gene Revolution", and analyzes how harmful effects of both are being amplified by two recently passed laws: the Seed (Amendment) Act 2015 and the Plant Breeders' Rights Act 2016. The analysis of these laws is done from a food sovereignty perspective on sustainable development, where food sovereignty represents "the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems." Finally, the paper offers comparative perspectives on seed policy and activism from Ecuador, Bolivia, India and Europe to suggest ways in which GM seeds have been approached with caution or outright bans, in order to promote health safety, farmers' rights, resistance to corporate monopolies over seed, and preservation of indigenous biodiversity. Ultimately, the paper sheds light on the forms of control and corporatization that patented GM seeds embody, and asks: who owns the seed and want kind of food do we want to leave for our future generations?

Introduction

Pakistan is a country at the crossroads of agricultural change. A majority of the country's population depends on the agricultural sector directly or indirectly for their livelihood, making any change in agricultural policy extremely significant. The recently passed Seed (Amendment) Act 2015 and the Plant Breeders' Rights Act 2016 are unprecedented and under-analyzed policies, that will unleash the use of Genetically Modified (GM) seeds in the country and produce far-reaching consequences for the state of agriculture and farmers, sustainable development, citizen and consumer rights, as well as the land itself.

The technology of genetically modified crops is being advanced in Pakistan and elsewhere under the cause of solving the crisis of world hunger and food scarcity. However, this new technology comes with a hefty price tag – in addition to the expensive seeds that local farmers will be forced to buy every season due to the monopoly of the corporate seed companies, they will also have to pay for the increased inputs these seeds require, such as extensive irrigation and costly fertilizers

and pesticides, which are already known to have severe negative consequences for the quality and productive capacity of the land and soil.

Being a World Trade Organization (WTO) signatory, Pakistan is also party to the Trade-Related Aspects of Intellectual Property Rights (TRIPS) agreement which gives exclusive rights of any novel commodity to the inventors of the novelty feature, leading to the patenting of Genetically Modified Organisms (GMOs). Accordingly, in 2000, Pakistan drafted a Plant Breeders' Rights Ordinance which would have threatened the food security of small farmers by disallowing them from saving, trading, sowing or selling their seeds and farm produce while simultaneously expanding the power of multinational seed companies on local agriculture (Suleri and Shah 2003). While the draft ordinance was halted due to criticism and advocacy from stakeholders, recent turn of events saw the Plant Breeders' Rights Bill again tabled in Parliament. The bill has now been passed into an Act, and provides seed companies with intellectual property rights for new varieties. However, without a proper system of checks and balances regarding which seeds are being introduced and at what price, these "breeders' rights" will be extremely exploitative and disenfranchising. Consequently, already marginalized stakeholders such as small and landless farmers and farmworkers, as well as the women amongst them, stand to suffer most. The Plant Breeders' Rights Act will thus exacerbate the negative impact of problematic legislation that has already been passed, such as the Seed (Amendment) Act 2015 which establishes fines and imprisonment for farmers for sharing and selling unregistered and unbranded seeds, and makes it mandatory for them to purchase seeds from licensed seed companies with registered varieties.

While more technologically advanced countries are showing reluctance in fully endorsing GM technology, and with worrying reports of GM crops causing farmers to be embroiled in financial ruin in India, critics are weary of Pakistan's rushed policymaking at the behest of powerful interests representing or seeking to benefit directly from this new phase of corporate agriculture.

This paper comes at a time when it is crucial to have a well-informed dialogue on agricultural policy, seed sovereignty, and sustainable development in Pakistan. By raising concerns on behalf of citizens, consumers and especially marginalized farmers and farmworkers who are most vulnerable to the enactment of these policies, and looking at comparative trends from other contexts, our purpose is to spread awareness and make policy recommendations that benefit the consumer, the farmer and the agriculture sector on the whole. The public in Pakistan has a right to know the contents and context of food, and needs to develop an informed voice in shaping policies that are radically altering our food-system.

Before moving ahead with the discussion, it is important to expand on the notion of food sovereignty which constitutes the key concern of the paper. The concept of "food sovereignty" was introduced by La Via Campesina, the International Peasant's Movement, at the World Food Summit in 1996. Since then, the concept has become

widely recognized and it has attracted a large number of advocates who see it as the main solution to the plight of poverty and hunger in the world.

Food sovereignty is defined as

> "the right of peoples to healthy and culturally appropriate food produced through sustainable methods and their right to define their own food and agriculture systems. It develops a model of small scale sustainable production benefiting communities and their environment. It puts the aspirations, needs and livelihoods of those who produce, distribute and consume food at the heart of food systems and policies rather than the demands of markets and corporations. Food sovereignty prioritizes local food production and consumption. It gives a country the right to protect its local producers from cheap imports and to control production. It ensures that the rights to use and manage lands, territories, water, seeds, livestock and biodiversity are in the hands of those who produce food and not of the corporate sector. Therefore, the implementation of genuine agrarian reform is one of the top priorities of the farmer's movement" (La Via Campesina 2011).

The Nature of Seed: The "Green" and the "Gene" Revolutions

The debate on seed begins with how one perceives its nature. Are seeds an incorruptible cog in the circle of life, owned by none and accessible to all, naturally leading to continuity and self-preservation of food and flora? Or are they patentable industrial inputs resulting from genetic experimentation for the largest, most profitable yields?

The latter view deems corporatized and biotechnology-fuelled agriculture as the sole panacea for global food problems. However, an examination of the Green Revolution and its after-effects shows that instead of eliminating scarcities, corporate agriculture may in fact create new scarcities (Shiva 1991). Furthermore, those on the "seed as a common good" side of the debate are weary of a new agricultural revolution taking root, one that is set to repeat the past mistakes of the Green Revolution in undermining traditional farming knowledge and food sovereignty to purportedly address food security. This so-called Gene Revolution (Bhutani 2013) features the genetic modification of seeds to give rise to new plant varieties that are owned by individuals and corporations, and are therefore patentable.

The advent of the Green Revolution can be traced back to the funding of an international agricultural research program in the early 1960s by the Rockefeller and Ford Foundations, with Dr. Norman E. Borlaug, the so-called "father of the green revolution" at the helm of the project. The subsequent transfer and adaptation of scientific agricultural advances of the developed world to developing countries led to dramatic increases in rice and wheat crop yields in Asia and Latin America in the 1960s. These increases in yield were only made possible however with a substantially greater use of irrigation, fertilizers and other chemical inputs. From rice and wheat, the

"revolution" then expanded to include the development of high yielding varieties of several other major food crops of developing countries (Hazell 2009). These agricultural advancements were given the term "Green Revolution" in 1968 by the director of the United States Agency for International Development (USAID), with the hopes of pre-empting the spread of "red," or socialist, revolutions (Schmalzer 2016).

According to a report describing the intensive input usage and resulting yields of the Green Revolution, "between 1970 and 1990, fertilizer applications in developing countries shot up by 360 percent while pesticide use increased by 7 to 8 percent per year. The amount of land under irrigation increased by one-third. The gains in production were dramatic: world cereal yields jumped from 1.4 tonnes per hectare in the early 1960s to 2.7 tonnes per hectare in 1989-91. Over the past 30 years, the volume of world agricultural production has doubled and world agricultural trade has increased threefold" (Food and Agricultural Organization of United Nations 2016).

The extent to which the Green Revolution addressed food shortages remains debatable, however, with new shortages being created in place of old ones (Shiva 1991). Moreover, the Green Revolution brought with it various lingering problems. These include expensive inputs leading to increased farmers' debt and poor irrigation management leading to waterlogging and salinity, with the latter affecting more than 20 percent of the irrigated land in China and Pakistan thus causing land infertility (Food and Agricultural Organization of United Nations 2016).

The soil leaching from the overuse of fertilizers and pesticides also posed environmental and health concerns, while also causing pest resistance. The most dire consequence of the "Green Revolution," however, was the alteration of the relationship of the small farmer with the seed as the seed was now a commodity that had to be bought instead of a gift of nature to be saved from year to year.

The Green Revolution also had a disciplinary element built into it. According to Shiva (1991):

Control over nature and control over people were essential elements of the centralised and centralising strategy of the Green Revolution. Ecological breakdown in nature and the political breakdown of society were essential implications of a policy based on tearing apart both nature and society. The Green Revolution was based on the assumption that technology is a superior substitute for nature, and hence a means for producing growth, unconstrained by nature's limits…the assumption of nature as a source of scarcity, and technology as a source of abundance, leads to the creation of technologies which create new scarcities in nature through ecological destruction (p 15).

For these repercussions of the Green Revolution to subside, policies need to be in place that are pro-poor and farmer-friendly, and corroborate the view of seeds as common heritage. According to Hazell (2009: 21), "Green Revolutions need to be small farm led to be pro-poor, but this does not automatically happen without supportive government policies…. Meeting these requirements typically required

proactive efforts by governments in the form of land reforms, small farm development programs, and input and credit subsidies. Not all Asian countries were successful in meeting these conditions, particularly those that began with inequitable land distributions."

Despite there being much to learn from the repercussions of the Green Revolution, the developing world is already at the cusp of the second major agricultural revolution of genetically modified and patentable seeds – the "Gene Revolution." Opposition to GM crops stems from environmental and health concerns, especially due to the lack of reliable information regarding their long-term impacts. There are also concerns regarding the limiting of farmer and consumer choice, and the problems of widespread corporate agriculture especially in developing countries which lack political infrastructure, proper checks and balances for plant registration, equitable land distribution and farmer-friendly legislation.

Thus, while the GMO debate is gathering steam the world over, developing countries like Pakistan stand to lose most at the hands of the Gene Revolution and its accompanying policies and impacts.

These policies firstly include legislation related to plant breeders' rights. Although plant breeders' rights legislation is applicable to local companies and multinational corporations (MNCs) alike, and applies both to GM and non-GM seeds, clever corporate usage of this law can essentially allow MNCs to use indigenous gene pools to create new genetically modified plant varieties that they can declare as their "invention" and subsequently patent. Corporate control over crop varieties would thereby increase, moving rights away from the farmers to the MNCs as MNC-endorsed seeds would gather steam. The new policies further include corporatization of agricultural farmland, whereby states give away large tracts of land to other countries or corporates, instead of addressing inequitable land distributions. Due to these policies, the increased foreign presence in the agricultural sector of developing countries has been likened to a "recolonization." Monopoly over market prices, influence over policy-making, undermining farmers' rights, destruction of biodiversity and food sovereignty through mono-cropping and loss of traditional knowledge are all facets of the dilemma.

The way in which powerful corporations and MNCs can lay claim to traditional knowledge systems through intellectual property "rights" is highlighted through the landmark patents case on a bio-pesticide created from a derivate of India's Neem plant. In 1995, a US company patented the bio-pesticide called Neemix for use on food crops although the process for which the patent had been granted had already been in use in India for many years. While the patent should have been overturned upon application on the basis of prior existing knowledge, and not after a ten-year struggle involving various petitions and legal efforts by India at the European Patent Office (EPO), the patent went through because "in the United States, 'prior existing knowledge' is only recognised if it is published in a journal – not if it has been passed

down through generations of oral and folk traditions" ('India wins landmark patent battle,' 2005).

Pakistan's Seed Industry and Politics - Historical Context

A historical context of seed politics in Pakistan must start with a discussion on land. The inequality in land distribution post-partition and the inheritance of a feudal system shaped by British colonialism set the stage for the disparity between Pakistan's small scale farmers and the large farm owners, as well as between farm tenants and landowners. Today, a mere 5% of large landholders in Pakistan are said to possess a massive 64% of the total farmland, while 65% of small scale farmers hold only 15% of the land (Nazeer 2015).

The current dependence of previously colonized countries on developed countries for agricultural expertise and technology can also be seen as a continuing form of colonial control. Sadeque (2014) writes that after the conquered countries regained independence, the former colonizers had to find other ways to continue acquiring resources and goods, which was then facilitated by the creation of institutions such as the World Bank and the International Monetary Fund (IMF). Under discourses of modernity and development, the rulers of countries in the South were led to believe that they were technologically backward and could only advance if they bought new technologies including agricultural ones from the West – a practice that maintained dependency, created debt, and worsened the environmental impact on Southern soils.

Pakistan's seed landscape suffered a lack of biodiversity following the Green Revolution as high-input, semi-dwarf varieties of staple crops such as rice and wheat were introduced on farms. By the early 1990s, just five of the "super varieties" accounted for 90% of the rice growing area of both peninsular Malaysia and Pakistan (Kuyek 2001). According to Sadeque (2014), it was easy to persuade the big farmers and landlords in Pakistan to use hybrid seeds along with their expensive inputs of chemical fertilizer, pesticides, machinery and the hybrid seed itself, when huge subsidies were given.

Local seed varieties were displaced by these hybrids, eventually to disappear, and by the mid-seventies, Pakistan's big farmers had gotten enough used to the technology to forget the traditional ways. The time was thus ripe to introduce a Seed Bill in 1976 that "would give preferential treatment to the commercial seed industry, local or foreign, discouraging farm-saved seed, and depriving women seed-savers of their traditional work" (Sadeque 2014).

A preferential treatment to corporate agribusiness was magnified when Pakistan became a member of the World Trade Organisation (WTO) in 1995 and subsequently, had to ratify the Trade Related Aspects of Intellectual Property (TRIPS) Agreement. This agreement essentially gave rights over a new seed variety or genetic material to the owner, disallowing any other entity from profiting from that variety's commercial usage.

This intellectual property regime can cause much more violence than the Green Revolution, because it creates public-private partnerships that promote "the use of proprietary technologies that do not respect the very sanctity of life itself. With the genetic manipulation (GM) of living forms including seeds, planting material and animal breeds, the sites of innovation are fast shifting from the fields to the laboratories" (Bhutani 2013, viii). This essentially ensures that all agricultural advancements are corporate-led instead of farm-led.

Unlike manufactured products, biological material is considered to lie in the domain of nature, and hence any gene exploration can be perceived as a "discovery" at most, and not an invention. Additionally, GM crops go against both the cultural norms as well as rights of Asian farmers as patents on seeds and life forms are unthinkable due to the ethics of growing food, and the importance of having a basic right to food in Asian countries (Kuyek 2001).

According to Sadeque (2008: 59), "Farming knowledge has historically been shared and free, just as with seeds and their exchange. The first attempt by the west to monopolise seeds was the concept of Plant Breeders' Rights. The title gives the impression that highly-trained professional farmers or agricultural scientists were alone capable of breeding new varieties of crops. Hardly so – peasants, especially women farmers of the southern hemisphere, have been the selectors and breeders of seeds and crops for over 10,000 years, a fact that governments with scant interest in citizens' rights avoid acknowledging."

Due to the Pakistani government's increased role in seed and PBR regulation, a role that favours the influx and operation of private seed companies and corporate agriculture, Pakistan's historical agricultural context thus primarily features a transfer from public to private involvement in its seed sector. Pakistan's local seed is consequently rendered vulnerable and less protected than the foreign, GM varieties. Seed saving and development that once every farmer was allowed to do are now special privileges that the farmer cannot access. Instead, they are being forced to turn away from the cultivation and saving of their local varieties in favour of corporate seeds. Pakistan's legislation concerning seed, PBR and land are being revised to meet the demands of a global, profit-driven seed industry at the expense of the rights of small-scale farmers. Thus legislation that allows land grabbing by foreign entities and that encourages commercial GM seed activity are already in progress, while farmer and ecologically friendly legislation that deals with biosafety and resource conservation exists in watered down, ineffective forms, as explained in the ensuing sections of the paper.

In a sense, these agricultural and land developments can be viewed as travelling in reverse, back to colonization times. Pakistan's selling of six million acres of farmland to foreign entities and consequently giving them extensive power over its resources and economy, is akin to it inviting multi-national colonists back into the country (SCOPE 2016).

Seed Corporations, Companies and Informal Sector Players in Pakistan

Provincial Seed Corporations

According to Rana (2014), the 1970s saw the establishment of provincial seed corporations in Punjab and Sindh and an Agriculture Development Authority in NWFP (now Khyber-Pakhtunkhwa), while the Government of Balochistan was made responsible for seed provision in the province. The performance of these institutions did not have the desired impact in Sindh, Balochistan and NWFP. Although the Sindh Seed Corporation was revived in 2006, its role has remained ineffective in seed provision, rendering the Punjab Seed Corporation as the only public sector seed provider.

Multinational Seed Companies (Monsanto Pakistan Agritech (Pvt.) Ltd., ICI Pakistan Ltd., Pioneer Pakistan Seed Ltd., Bayer CropSciences and Syngenta Pakistan Ltd.)

Five main Seed MNCs function in Pakistan, playing a significant role in introducing hybrid seeds such as maize, sunflower, fodder, canola, alfalfa, and sorghum (Rana 2010). In the 1990s, Monsanto mainly produced cotton, rice and wheat for local sale as well as for Afghanistan through export. Arguably, seeds for these crops are not being produced by Monsanto in Pakistan since 2002-2003 – a claim that farmers and rights groups dispute due to the widespread availability of Monsanto seeds in the local market. On the other hand, Syngenta and Bayer have scaled down their involvement in the seed business to refocus on their agrochemical business. Both companies are however, carefully looking out for developments regarding commercialization of GM crops, as they wish to commercialize their GM seeds in Pakistan (Rana 2010).

Local Seed Companies

750 Pakistani seed companies were registered in 2013, with the majority of them concentrated in Punjab at 82 percent. Most of these companies function from Southern Punjab which is well-positioned for access to the Sindh and Balochistan seed markets (Rana 2014).

Informal Seed Sector Players

Pakistan's informal seed sector is large, with uncertified seeds accounting for about 80 percent of the total seed requirement annually (Rana 2014). The informal sector comprises of "(1) farmer-to-farmer seed exchange on a non-commercial basis, (2) small-scale farmer-to-farmer seed sale, (3) farmer-saved seed for planting in subsequent years, and (4) medium- to large-scale sale of seed in brown bags" with the last two categories making up the bulk of the informal seed sector (Rana 2014: 20). According to Rana (2014), the case of Bt cotton is instructive when looking at Pakistan's informal seed sector. Bt cotton seeds first reached Sindh in 2002–2003 from abroad through enterprising farmers who initially planted them on a small-scale

basis but with steadily growing popularity. Meanwhile, the crossing of local cotton varieties with Bt material resulted in further Bt varieties, so that by 2007, Bt varieties accounted for 80 percent of the cotton cultivation area in Sindh and 50 percent in Punjab (Ali et al. 2007, as cited by Rana 2014). Unapproved Bt cotton varieties have therefore been widely marketed in the informal sector, so much so that non-Bt cotton became limited to a small fraction of the total cotton cultivated land, one that continues to steadily decline. The role of Monsanto in promoting this proliferation of Bt seeds is acknowledged by farmers' rights groups.

Legal Regimes and their analysis

This section of the paper presents information pertaining to the trajectory, current status and salient features of key legislative regimes affecting seed politics, farmers' rights and land rights in Pakistan.

The Seed Act 1976 was the first Act of its kind in Pakistan to lay down a set of principles regarding seed quality regulation, certification and registration of crop varieties. The Act's preamble states that its objective is "controlling and regulating the quality of seeds of various varieties of crops." Although it left much to be desired in terms of establishing proper infrastructure as a pre-requisite for its clauses, the Act and the subsequent rules developed under it led to the formulation of regulatory and certification authorities, the provision of important definitions relevant to the seed sector and the penalties for commercial activity concerning misbranded or unregistered seed.

Amendments to the 1976 Act were in process in the form of an Amendment Bill in 2009, but it made real headway in October 2014, when the Seed (Amendment) Bill 2014 was cleared by the National Assembly's Standing Committee on National Food Security and Research, and consequently passed by the National Assembly in March 2015. The Senate then received the bill from the National Assembly, and after the Senate Standing Committee on National Food Security and Research approved the Seed (Amendment) Bill 2015 in June 2015, the Senate speedily passed it into law in July 2015. The president's assent for the Act was granted on the twenty-third of July 2015 and it was published in The Gazette of Pakistan shortly thereafter

While the 1976 Act does address private interests, the Seed (Amendment) Act 2015 takes it a lot further. The 'Statement of Objects and Reasons' section for the 2015 Bill, signed by the Minister of National Food Security and Research, observes that "the Seed Act 1976 does not fulfil the requirements of the modern seed industry." It goes on to say that the current Seed (Amendment) Bill keeps in mind the emerging reality of the impairment of the public sector and the strength of the private sector to offer a level playing field to both sectors. Additionally, it states that "new innovations in hybrid technology and Genetically Modified Crops (GMCs) have transformed the seed industry," thus the Bill clearly sets out to cater to these innovations, and build a more favourable environment for foreign companies to invest in Pakistan's seed sector.

Part 1 of the Seed (Amendment) Act 2015 also states that "the Provincial Assemblies of Balochistan, Khyber Pakhtunkhwa, Punjab and Sindh have passed resolutions under Article 144 of the Constitution of the Islamic Republic of Pakistan to the effect that Majlis-e-Shoora (Parliament) may suitably amend the aforesaid Act." Article 144 of the Constitution of Pakistan empowers the Parliament to legislate on behalf of provinces on the basis of their consent, given that the provincial assemblies can still amend or repeal any act passed in this manner.

Crux of Seed Legislation and Successive Clauses

In this section, the salient features of the Seed (Amendment) Act 2015 are discussed, alongside notable variations in successive clauses from the initial 1976 Seed Act to the current legislation.

Firstly, since the Federal Seed Certification Agency (FSCA) & National Seed Registration Agency (NSRA) as described in the 1976 Act were merged together as the Federal Seed Certification & Registration Department (FSC&RD) in 1997 on the basis of an austerity measure, the corresponding changes have been made in the 2015 Amendment Act.

Second, there are many additions and variations in the definitions laid out in the 2015 Amendment Act. In the 1976 Act, "basic seed" was a seed produced by an organization set up by a Provincial Government, while the 2015 Amendment Act includes the private sector in its definition in article 2(4): "basic seed means progeny of the pre-basic seed produced by any public sector or private sector organization and certified by the FSC&RD." The definition of "Hybrid" seeds has also been added in article 2(9): "(l) the first generation offspring of a cross between two individual plants differing in one or more genes: (2) the progeny of a cross between species of the same genus or of different genera."

Authorization of Genetically Modified Organisms (GMOs) Registration

Definitions added in the 2015 Seed (Amendment) Act include "genetically modified variety" in article 2(8), which stands for "varieties which have been bred by genetic engineering involving molecular techniques that modify, recombine and transfer genes or segments of genetic material and includes recombinant deoxyribonucleic acid (DNA) techniques that transfer genes or segments of genetic material between genotype and also apply to plant varieties derived from a living modified organism."

The term "terminator technology" is also introduced in relation to GMOs in article 2(17) as "genetic modification that includes gene or gene sequences which restrict germination of the seed produced by the plant variety or hybrid during the next subsequent year of planting."

According to the addition of Section 22G in the 2015 Amendment Act's article 11, the registration of GM plant varieties is subject to an undertaking by the applicant

that the variety does not contain any gene or gene sequence involving terminator technology. A certificate from the National Bio-safety Committee (NBC) would be a required for the approval of the plant variety to confirm that it will have no adverse effect on the environment, human, animal or plant life and health, relying on the data of two crop season trials, which would then "satiate environmental concerns about GMC," according to the "Statement of Objects and Reasons" accompanying the 2015 Seed Amendment Bill.

Under the 2015 Amendment Act, the private sector will be allowed not only to produce basic seeds for their multiplication and certification but also to establish accredited seed testing laboratories. Here, "accredited laboratory" means any seed testing laboratory established in the public sector or private sector and accredited by the appropriate organization.

Setting seed labelling standards

Unlike the 1976 Act, the 2015 Seed (Amendment) Act addresses seed labelling by introducing the definition of "truthfully labelled seed" in article 2(18) as a seed of a registered variety or hybrid produced locally or imported and which conforms to standards as prescribed under the rules of the Act. Moreover, a detailed delineation of "misbranded" seeds is provided in article 2(9), including the following descriptions: (i) a seed which is a substitute for, or resembles in a manner likely to deceive, another plant variety or hybrid of seed under the name of which it is sold, and is not plainly and conspicuously labelled so as to indicate its true nature; (ii) it is falsely stated to be the product of any place or country; (iii) it is sold by a name which belongs to another kind or plant variety or hybrid of seed; (iv) false claims are made for it upon the label or otherwise; (v) the contents are not conspicuously stated when the seed is in packaged form or that the packaging is deceptive; (vi) it does not include the necessary caution for the environment and plant and human life. Businesses engaging in misbranded seeds will be penalized according to the rules of the Act.

Enhancement of fines and penalties against the sale of substandard seeds in the market

In the "Statement of Objects and Reasons" of the 2015 Bill, the penalties laid out in the 1976 Act are said to be too meagre to effectively deter seed violations. The penalties are significantly upped, even from the 2014 bill to the 2015 Bill and Act. The 2014 bill sets the fine amount at Rs. 25,000 while the 2015 Amendment Act sets it at Rs. 200,000.

The penalties for punishable acts are listed in article 12 of the 2015 Amendment Act, as substitution for section 23 of the 1976 Act. These penalties apply to whoever acts in violation of the Act and imports, sells, holds in stocks or exhibits for sale or barter or otherwise supplies any seed of any kind or plant variety or hybrid which is misbranded, or not a registered or enlisted plant variety or hybrid. They fall on any person who obstructs the work of an official under this Act or prevents a Seed Certification Officer or a Seed Inspector from taking a sample or inspecting seed

under this Act. The penalties include, in the first offence, imprisonment for a term which may extend to three months or with fine not exceeding two hundred thousand rupees, and for every subsequent offence, the imprisonment for a term which may extend to six months or with fine not exceeding six hundred thousand rupees or both.

Clear definition of the role of registered seed companies, seed dealers, seed processing units and fruit plant nurseries established in the private sector

"Seed Business" is defined in the 2015 Amendment Act as any commercial operation of seed involving production, processing, conditioning, packaging, distribution, import and export of seeds. The 1976 Seed Act was silent on seed company registration. In 1979, an Inter-ministerial Working Group was created to register or deregister new seed companies. However, since the Working Group was not a statutory body, it could not create a new organization, and thus only registered again seed companies that were already established under other instruments such as the Companies Ordinance 1984 (Rana 2014). This led to a slowing down of seed business operations. The 2015 Seed Act effectively brings the registration of seed companies under its ambit, with a 5-year registration period granted to seed businesses with renewal of further five-year terms.

Additionally, a seed dealer may apply for a provisional dealership license after one year without the pre-condition of prescribed training. After training, the seed dealer may apply for a regular 3-year licence. All seed dealers must also clearly display at their place of business the sale prices of different crop seeds held, including the opening and closing stocks on a daily basis.

Moreover, Section 22A states that the FSC&RD (Federal Seed Certification & Registration Department) may register or enlist plant varieties or hybrids imported for general cultivation on the basis of the results of multi-location trials for at least two crop seasons within Pakistan.

The Act further facilitates the set-up of private horticulture nurseries as well as seed processing units that meet the requirement of infrastructure, equipment and qualified manpower as well as the filing of periodic returns.

Finally, an important omission from the 2015 Amendment Act that was part of the 1976 Act pertains to the compensation paid by the government to the person from whom a seed inspector takes a seed sample from for examination, calculated at the rate at which such a seed is usually sold for in the market.

Plant Breeders' Rights Legislation in Pakistan

Plant Breeders' Rights are essentially developed to give rights over a new variety to the owner, barring any other individual or entity from profiting from that variety's commercial usage. The requisite ratification of the Trade Related Aspects of

Intellectual Property (TRIPS) Agreement by Pakistan as a member country of the World Trade Organisation (WTO) set the stage for intellectual property protection of plant varieties in the country. Setting minimum standards for intellectual property protection, Article 27 of the TRIPS Agreement, "Patentable Subject Matter," declares that "patents shall be available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application." Article 27.3 (b) further elaborates that plant variety protection will be provided by member countries either by patents or an "effective sui generis system" or by any combination of the two.

While incumbent upon members, the Agreement does not specify the nature or regulations of the sui generis system. Consequently, member countries do possess a certain level of liberty to develop protection mechanisms that best serve the interests of their people and economy. Nevertheless, Pakistan's Plant Breeders' Rights (PBR) legislation seems to pander to the vested interests of plant breeders and multinational seed companies, while concerns of farmers' rights, food sovereignty and protection of local varieties are not adequately addressed.

The Legislative Process of Plant Breeder's Rights in Pakistan, Placed in Context

Pakistan acquired WTO membership in 1995 as a "developing country" member, therefore it was granted a five-year transitional period for TRIPS implementation which culminated in 2000 with Pakistan's release of the Patents Ordinance 2000. Specifically, pursuant to the TRIPS Agreement Article 27.3 (b) for agricultural patents, the Plant Breeders' Rights Act was additionally prepared as a draft bill in 1999 by the Nawaz Sharif government and then completed under General Musharraf's regime in 2000 as an ordinance. However, its promulgation was halted after pressure was exerted on the government by certain advocacy groups and stakeholders (Suleri and Shah 2003).

The draft PBR Ordinance 2000 and its predecessor bill were grounded in the 1991 Treaty of International Union for the Protection of New Varieties of Plants (UPOV). The UPOV has served as the basis of forming a "sui generis" plant protection system that the TRIPS agreement specifies, by ensuring that the members subscribe to the minimum protection standards contained in the treaty. UPOV has a membership of 74 states or organizations, including the European Union, Australia, the United States and the United Kingdom. To conform to international standards of protection and create a favourable investment environment, Pakistan did entertain the possibility of joining UPOV, thereby developing PBR legislation that is still influenced by the treaty. However, it eventually opted not to join the convention.

Plans for the enactment of the PBR legislation that was developed in 2000 were never dropped, as corroborated by the Plant Breeders' Rights Bill making the rounds in 2006 and intermittently since, right until its current status in 2016 as tabled for passage in parliament. Presented to the PPP government in 2008, the government sought

legislative approval from provinces as per Article 144 of the Constitution of Pakistan, and it was purportedly attained by 2015, after which the bill was relaunched in the National Assembly (NA) at the end of 2015 (Sial 2016).

Introduced in the National Assembly in November 2015, the Plant Breeders' Rights Bill 2015 was passed by the NA Standing Committee on Cabinet Secretariat on the 6th of January, 2016 with "slight amendments" according to an NA press release (National Assembly Secretariat Press Release 6th January 2016). Although the Chairman of the NA Standing Committee on Cabinet Secretariat, Rana Mohammad Hayat Khan, expressed an inclination towards a speedy approval of the bill in a prior meeting, other committee members insisted on having an additional meeting with relevant stakeholders in attendance, including farmers, private seed companies and provincial government officials. In that meeting, although stakeholders and members did express reservations regarding the precedence of breeders' rights over farmers' rights, the bill was hastily approved, with Rana Mohammad Hayat Khan and the Federal Minister of National Food Security and Research, Sikander Hayat Bosan, espousing the positive impact expected from the Act, including provision of high quality seeds for farmers and increase in foreign private sector investment (Bokhari 2016).

In a meeting of the National Assembly Standing Committee on Cabinet Secretariat, held on 9th March 2016, proposed amendments to the Plant Breeders' Rights Bill 2015 were submitted by stakeholders such as the MNFS&R, IPO-Pakistan and MNA Asad Umar. Deliberation on the proposed amendments featured a conflict over administrative control of Plant Breeders' Rights between the Ministry of National Food Security and Research (MNFS&R) and the Intellectual Property Organisation of Pakistan (IPO-Pakistan), which is an autonomous regulatory body for intellectual property rights in Pakistan, established in 2005 under the administrative control of the Cabinet Division (Sial 2016). The main difference of opinion was concerning the jurisdiction of the National Agriculture Registry (NAR) that will administer protection to agriculture inventions. According to precedents in most other major agriculture-producing countries, the agricultural registry falls under the ambit of the ministry of agriculture, such as in India; however, there are examples such as that of Singapore where the registry is handled by the country's IPR organization (Sial 2016). While the Cabinet Division wants the NAR to be handled by the Ministry, IPO-Pakistan is pushing for the registry to be maintained by a purportedly neutral organisation such as itself (Sial 2016). The IPO-Pakistan website clearly states that after enactment of the PBR Bill, "the PBR Registry will be set up under administrative control of IPO-Pakistan on modern and competitive lines to provide an effective intellectual property right system for granting protection to the development of new plant varieties and to establish a viable seed industry for the improvement of agriculture to ensure the availability of high quality seeds and planting material to the farmers" (Intellectual Property Organization of Pakistan 2016).

The Plant Breeders' Rights Act 2016 was passed by the Senate in November 2016, and formally passed into law as an act of parliament by receiving the President's assent in December 2016.

Crux of PBR Legislation and Successive Clauses

In this section, the salient features of the Plant Breeders' Rights legislation are discussed, alongside notable variations in successive clauses as well as proposed amendments, incorporating the latest developments at the time of writing, as the legislative process for PBR is ongoing.

In the preamble to the 2006 and 2016 Bill (but not in the draft PBR Ordinance of 2000), Article 144 of the Constitution of Pakistan concerning provincial involvement is mentioned in relation to parliamentary PBR legislation, with the PBR Bill 2016 stating: "WHEREAS the Provincial Assemblies of Balochistan, Khyber Pakhtun Khawa, Punjab, and Sindh have passed resolutions under Article 144 of the Constitution of the Islamic Republic of Pakistan to the effect that Majlis-e-Shoora (Parliament) may regulate and make law on Plant Breeders' Rights and matter connected therewith." Article 144 essentially states that if one or more provincial assemblies allow the Parliament to regulate a matter not specified in the Federal Legislative List, it will be lawful for Parliament to pass an Act in relation, keeping in mind that the act can be amended or repealed by the provincial assembly of the province to which it applies.

The PBR drafts throughout the years all specify the establishment of a Plant Breeders' Rights Office or Registry, however in the 2000 draft Ordinance and 2006 Bill, this is placed under the domain of the Agriculture Ministry (then Ministry of Food, Agriculture and Livestock) while in the 2015 Bill, the Registry is notably to be established under the "Organization," referring to IPO-Pakistan. In the 2016 PBR Bill however, there is to be a "Plant Breeders' Rights Registry" set up by the Federal Government under the MNFS&R. Headquartered in Islamabad, the Registry may with prior approval of the federal government set-up provincial and other such offices according to requirement. The functions of the Registry include registration and promotion of new plant varieties, issuance of certificates under the Act and protecting the rights of farmers and breeders as laid out in the Act.

The 2016 PBR bill also instructs the federal government on establishment of a Plant Variety Protection Advisory Committee consisting of public and private sector members who may advise the Ministry (in place of IPO - Pakistan in the 2015 Bill) or the Registrar of the Registry on certain scientific and technical issues which may be referred to it.

Significantly, the 2016 Bill sets the criteria for a new plant variety: it should conform to the features of novelty, distinctiveness, uniformity, stability and should be designated by an acceptable denomination. Novelty is specified as the plant variety not having been sold or marketed by or with the agreement of the applicant, for more than one year in Pakistan, for more than six years in the case of trees or vines and for more than four years in the case of all other plants in a foreign country before filing for a certificate under this Act. The particular aspect of the Bill remains unchanged from the 2000 draft.

In the 2015 Bill and 2016 Bill, requirements for registering GMO varieties for breeders' rights mirror the 2000 and 2006 draft, in that a certificate from the National Bio-safety Committee should be submitted by the applicant stating that the variety will have no adverse effect on the environment, human, animal or plant life, and health. Moreover, an affidavit sworn by the Applicant should also declare that the variety does not contain any gene or gene sequence involving "terminator technology."

An application for variety certification should include descriptions and drawings or photographs which disclose clearly the distinctive characteristics of the variety from other varieties of the same crop, and these characteristics may be tested on order of the Registrar as part of a distinctiveness, uniformity and stability (DUS) trial or any other specific test required by the Federal Seed Certification and Registration Department.

The 2016 Bill enjoins advertisement of the application which can be refuted within four months from the date of advertisement by any person opposing the granting of rights to the applicant through written notice and documentary evidence proving that the opposition is entitled to the rights for the new variety or that the variety is not protectable within the Act. Additional grounds for opposition include that the grant of a certificate may not be in the public interest or that the variety may be detrimental to the environment, human, animal or plant health.

The exclusive rights granted to plant breeders as identified in the bill's article 22 include "(a) Offering for sale or selling or marketing of the reproductive or vegetative propagating material of the protected variety in Pakistan; (b) importing the reproductive or vegetative propagating material of the protected variety into Pakistan or exporting it from Pakistan; (c) conditioning or multiplying the reproductive or vegetative propagating material of the protected variety; (d) carrying out any of the acts identified in clauses (a), (b), and (c) in relation to an essentially derived variety provided the protected variety is not itself an essentially derived variety; (e) instigating or promoting any of the acts identified in clauses (a), (b), (c) and (d); (f) authorizing any person to produce, sell, market or otherwise deal with a protected variety; (g) stocking for any of the purposes mentioned in clauses (a) to (d) and (h) Subject to any other provision of this Act no other person shall perform any of the acts mentioned."

A less expansive list of Farmer's rights in the form of exceptions is also provided, which entitles a farmer to save, use, sow, re-sow, exchange, share or sell his farm produce provided that he cannot sell the seed of a variety protected under the Act on a commercial basis without complying with the requirements of Seed Act, 1976 and Seed (Amendment) Act, 2016. It also allows for the exchange of "reasonable" amounts of propagating materials among farmers (amendment proposed in March 2016 to specify the amount in the regulations).

It is important to note the proposed deletion of article 25 (f) in the Bill after the March 2016 proposed amendments. The article allows as an exception, the sale of farm-saved seeds in situations where farmers cannot make use of the farm-saved seeds on their

own holdings due to circumstances beyond their control, such as natural disasters or other emergencies, given that the amount of seeds sold is not more than the amount required for the farmer's own holding. The amendment to exclude this provision was proposed by the MNFS&R with the justification that fair use of this allowance was very unlikely and that a precedent for this provision had not been set in the PBR law of any other country.

The Act also lists benefit sharing provisions, as claims for benefit sharing for a registered variety will be invited after publication of the certificate by the registrar within a prescribed period. Claims may only be submitted by an individual, group, firm, governmental or non-governmental organization, given that the person or group of persons hold Pakistani citizenship or that the firm or governmental or non-governmental organization is formed or established in or outside Pakistan. "Or outside" Pakistan was later added as a proposed amendment by the MNFS&R with the justification that protection of genetic material is supported both inside and outside of Pakistan. The Act also states that to determine the amount of benefit sharing due, the Registrar will take into consideration the extent and nature of the use of genetic material of the claimant in the development of the variety in question as well as the demand and commercial utility of that variety.

Infringement of the PBR Act is described as actions in violation of the rights granted to Plant Breeders' by the Act, including the illegal usage of a variety protected by the Act to produce an essentially derived variety or F1 hybrid for commercial utilization. An article of the Bill additionally states that a suit will not be instituted for the infringement of a protected variety or relating to any right provided by the Act in any court inferior to the Court of District Judge.

Nevertheless, it is interesting to note than an amendment to this has been proposed by IPO-Pakistan, stating that the Intellectual Property (IP) Tribunal should have exclusive jurisdiction to try the suit. IPO-Pakistan gave the justification that all IP infringement cases were now being transferred from District and Session Courts to these Tribunals, which were already operational in Islamabad, Lahore and Karachi with the appointment of presiding officers and the enforcement of relevant sections of the Intellectual Property Organization Act 2012. The Bill also stated that all fees collected under the Act through a prescribed schedule of charges be deposited in the Intellectual Property Organization fund. Since IPO-Pakistan was removed as the regulatory body associated with this Act, these proposals and amendments no longer apply.

Incentives for the promotion of research and development are additionally put forth by the Bill, with the instruction to establish a Research Incentive Board by the Federal Government and each of the Provincial Governments. The Board will create incentives for the promotion of research and development for scientists and their teams working on developing new plant varieties, such as the entitlement to a minimum of forty percent of the royalty or profits gained by the institute through any commercial deal.

The 2016 Bill also gives the registrar the power to grant compulsory license, based on factors such as public interest or reasonable public requirement for particular seeds or propagating material.

Analysis of Legal Regimes: Their Impact on Farmers' Rights and Citizens' Rights in Pakistan

In light of Pakistan's legal regimes concerning the seed sector and wider debates on seed politics, key points of discussion have been highlighted and explained in this section.

1. **Much of the legislation discussed in the prior section presupposes infrastructure, monitoring and regulatory mechanisms, transparency and trained government personnel. These either do not exist or do not function at the level of sophistication that is required as a pre-requisite for the legislation to work without exploitation by the powerful to serve their interests at the expense of the rights of small-scale farmers and farm workers.**

According to Sadeque (2014), the Seed (Amendment) legislation is arbitrary, as it serves the vested interests of corporations and does not involve all stakeholders. She states that "safeguards claimed by the Bill don't even exist, because the infrastructure and personnel don't exist. It's just a paper claim to authorize corporate control" (Sadeque 2014).

These "paper claims" are evident when one considers, for instance, the mere requirement of a certificate from the National Bio-safety Committee (NBC) to get approval of a GMO variety – a certificate which would, in the words of the Minister for National Food Security and Research in the 'Statement of Objects and Reasons' section of the 2015 Seed Bill, "satiate environmental concerns about GMCs." It is hardly satisfactory that a certificate relying on the data of two crop season trials, the procedure and monitoring mechanism of which is unclear, can confirm that a particular GMO variety will have "no adverse effect on the environment, human, animal or plant life and health."

Just as absurd is the provision in the National Bio-safety Guidelines 2005 that allows an IBC to ask the NBC for an exemption the required laboratory work and fieldwork of genetically modified organisms on the "sufficient" grounds that no risk is posed. Moreover, if the exempt status is granted, the commercial release of the variety on a priority basis can also be considered by the NBC, processed within a thirty-day period. Keeping in mind that an IBC membership also comprises of the head of the institute in which it is based, the potential for misuse of power is too great to justify the provision of the aforementioned privileges.

Pakistan's noncommittal responses in the 2nd Regular National Report from 2014 on the Implementation of Cartagena Protocol on Biosafety don't help much, where Pakistan admits that a domestic regulatory framework is "partially" in place to enforce the Biosafety Protocol, and that there is no allocations of funds or permanent staff relating

to the operation of its national biosafety framework. It also admits to its financial and HR issues, deeming its capacity inadequate in addressing biosafety requirements.

Infrastructure and monitoring mechanisms with regards to Plant Breeders Rights Legislation are additionally unclear, and make the farmer's position more vulnerable by not making provisions in case of the sowing of a protected variety unknowingly. This is not a farfetched scenario given the informal or unlabelled distribution of seed in Pakistan, as well as accidental contamination through neighbouring fields (as in the dispute of Monsanto Canada Inc. v Schmeiser, which Monsanto won). The way Pakistan's PBR system is being set up, it would be easy for a seed corporation to sue a farmer for patent infringement, given especially the weak position of the farmer in the existing agricultural and political system. The culture of fear and intimidation surrounding seed companies such as Monsanto, in the countries in which they openly and expansively operate, could be Pakistan's future if PBR passes into law.

The jurisdictions of the IPO – Pakistan and the Ministry of National Food Security and Research are unclear in terms of PBR implementation, adding to the infrastructural deficiencies that leave the PBR Registry open to exploitation and manipulation. Broadly, there is a dire need for infrastructural improvement and a checks and balances system to properly implement legislative provisions, handle infringement cases and control market seed price, among other vital regulatory functions.

Pakistan has been repeatedly allocated the "Priority Watch List Countries" status in the Special 301 Report by the Office of the United States Trade Representative (USTR) till as recently as 2015, meaning that it features "serious intellectual property rights deficiencies" due to IP violations and rampant piracy. These violations heighten the need for monitoring, and hinder the very foreign investment that the PBR legislation sacrifices farmers' rights for, rendering the exercise futile.

When the county is struggling with granting and regulating simpler IP rights pertaining to media, apparel and non-biological items, it is worrying to think that the same IP organization might bring the much more complex PBR implementation and monitoring under its ambit. In the 2015 Special 301 Report by the USTR, it particularly recognizes the inability of the IPO – Pakistan to fully establish the specialized intellectual property tribunals as per the IPO Act. These are the same tribunals that are proposed by IPO – Pakistan to try PBR infringement cases. This raises the question whether such a tribunal can adequately and justly address alleged infringement cases.

2. **Pakistan prioritizes the enactment of some of its international agreements over others. It is not adequately mindful of the Cartagena Protocol and the Nagoya Protocol under the Convention on Biological Diversity (CBD) and the COP21 agreement of the Paris Climate Conference 2015 on forest conservation. On the other hand, the TRIPS agreement and the UPOV, to which Pakistan is not even a signatory but nevertheless influenced by, feature prominently in its legislation and are oriented towards corporate agriculture. The sets of pro-trade (TRIPS and UPOV) and pro-**

conservation and biodiversity (CBD and COP21) agreements are inherently at conflict with each other, and if Pakistan pays excess homage to one set in its legislation, its legal and agriculture system cannot be balanced or equitable.

Pakistan is bound by both the Cartagena Protocol and the Nagoya Protocol under the CBD. The former deals with biosafety, seeking to protect biological diversity from the risks associated with GM technology. It promotes the exercise of caution with regards to new biotechnology, with public interest taking priority over economic gain, thereby allowing for precautionary bans of undetermined GM varieties. The Nagoya Protocol provides an implementation framework for the fair and equitable sharing of benefits arising out of the utilization of genetic resources to ensure conservation and sustainable use of biodiversity.

Instead of the heavy influence of TRIPS, a consideration of CBD protocols in Pakistan's Seed and PBR legislation would allow for a more balanced approach to food sovereignty and the rights of small farmers in particular. In the case of PBR, a balanced plan of action would ensure that plant breeders should receive their due rights while at the same time the rights of farmers should not be overlooked.

Pakistan is not a member of UPOV and while its adherence to the TRIPS agreement is mandatory, member countries do possess liberty to develop a sui generis system by adapting policies that best serve their public interest. That being said, the pressure from foreign entities and the private sector make this a very difficult task to accomplish. Here, it is interesting to note that the UPOV, which was first adopted in 1961, has been revised in 1972, 1978 and 1991. The successive versions increasingly limit the rights of the farmers and breeders, with the protections granted to breeders in the 1991 version mimicking those granted under the patent system (Kuyek 2001). While the UPOV's 74 member countries ascribe to different versions of the convention, interestingly Pakistan has modeled its PBR legislation according to the stricter 1991 version. Hence, even while some countries have tried to ensure farmers' rights in their Plant Variety Protection (PVP) legislation during their implementation of the TRIPS agreement – such as their rights over local varieties, biosafety clauses and compulsory profit sharing of PVP-protected seeds – the witnessed trend is towards "harmonization" with seemingly progressive PVP drafts having their farmer-friendly provisions removed or watered down to the extent that they read unmistakably like UPOV laws (Kuyek 2001).

With regards to the Seed (Amendment) Act 2015, while its regulation of GMOs requires an approval certificate from the NBC in accordance with the Biosafety Rules 2005 based on the Convention on Biological Diversity (CBD), the clause does not adequately adhere to the CBD's biosafety guidelines and is not corroborated by the requisite infrastructure and planning to ensure that risky GMOs are not cultivated or commercialized in Pakistan.

3. **Under the 18th Amendment in the Constitution of Pakistan, both Agriculture and the Environment are provincial subjects, and hence**

federal and parliamentary processes on Seed and PBR legislation without the involvement of the provincial assemblies render the legislation unconstitutional

Although it has been stated by parliamentarians that the provincial assemblies have approved of the PBR and Seed legislation, this is not manifestly clear and there is lack of documentary evidence or government notices to corroborate provincial discussion and approval of these controversial legal regimes.

A letter written to the Chairman of the Senate Raza Rabbani by a farmers' organization, the Pakistan Kissan Mazdoor Tehreek (PKMT), on the subject of the 2014 Seed (Amendment) Bill attests to it being unconstitutional (Roots for Equity 2015).

The letter challenged the Government's claim that a resolution had been passed from each provincial assembly through which provinces had granted the National Assembly the right to proceed with legislation in this subject matter, therefore rendering the legislation in line with the 18th Amendment as provincial approval had allegedly been sought. PKMT states that their own inquiry from the Sindh Assembly Secretariat negates the aforementioned claim, as no such resolution had been passed by the Sindh Assembly. PKMT further urged the Senate to act responsibly in this regard and pay attention to the many social, technical and scientific issues outlined in the letter that have led to so many opposing this Act, calling the issues "anti-farmer, anti-people and anti-Pakistan." In closing, the letter asked the Chairman to not allow a law on agriculture that lets MNCs capture Pakistan's food and agriculture system.

Unfortunately, the Senate went on to pass the bill into law soon after. Upon further investigation from appropriate sources in the Senate Secretariat on the letters sent by PKMT for the purpose of this paper, the receipt or knowledge of existence of those letters was not admitted.

4. **The recent Seed and PBR legislation does not include specific or adequate provisions for women farmers and tenants, which is vital considering the economic and socio-cultural role of women in Agriculture as well as their labour and land rights.**

Rural Pakistani women play a vital role in subsistence as well as commercial farming activities; however, due to societal and cultural norms, their role is often invisibilized and ignored even within discussions of food sovereignty and farmers' rights. Their self-sufficiency and decision-making powers are thus obstructed. Since women' position is already socially and economically marginalized, women will most likely be affected drastically by legislation that favours the corporatization of agriculture.

5. **The inclination of the legislation discussed in this paper towards corporate-controlled agriculture coupled with Pakistan's lack of pro-farmer policies and seed market regulatory systems, will not only grossly undermine farmers' rights but also adversely affect national sovereignty,**

land and environment, food security, and consumer health. A renewed neoliberal-imperial colonization is not implausible, if the stakes of MNCs in Pakistan's seed industry remain unchecked and the land-grabbing activities of foreign entities – as well as of the Pakistani government on their behalf – continues on Pakistani soil

By being disallowed the importing, selling, holding in stocks, exhibiting for sale, bartering, or any kind of supplying of any unregistered seed under the Seed (Amendment) Act 2015, and by only being allowed to purchase registered seed from licensed dealers, local farmers who deal in the business of farm-saved seed will suffer unsparingly. Their plight does not end here. With the regulation of GM seeds under both Seed and PBR laws, even the personal tradition of saving and re-using of seeds by local farmers will be severely impacted. Even if farm-saved seed that others have not patented (yet) can be reused restricting it to one's own land as mentioned in PBR legislation, GM influx will lead to widespread contamination which will eliminate seed choice by the annihilation of local farm-saved seed, just as it has happened in the case of cotton in Pakistan, with local cotton being all but replaced by BT cotton. Additionally, the patents regulated under PBR may allow bio-piracy to occur and restrict local seeds from being saved and re-used. Foreign companies may obtain patents for local plants or their derivatives, exemplified by the previously mentioned ten-year legal battle resulting from the European Patent Office (EPO) granting a Patent for a Neem derivative to the US Department of Agriculture and the multinational WR Grace in 1995, despite Neem being an indigenous Indian plant.

Due to such exploitative practices of multinationals in the name of "innovation," the new legal regimes of seed policies in Pakistan have the potential to lead to the monopolization of Pakistan's seed market by multinational seed corporations, causing unchecked hikes in seed and input prices which will be severely debilitating for farmers. Moreover, by prescribing the payment of royalties by farmers to MNCs on usage of protected seeds, limits will be placed on the farmers' rights to choose and buy seeds. They will be forced to repeatedly buy expensive seeds and inputs, adversely impacting their quality of life and livelihoods, while their liberty to economize through seed-saving and trading will be taken away. Just like the virtual impossibility of growing non-GM canola in Canada because of a widespread contamination that has even reached Japan (Greenpeace Canola Report 2005), it is alleged that cotton farmers in Pakistan will also have no choice anymore but to grow BT cotton.

As corporate control over Pakistan's food system will increase, the right of its people to food sovereignty will decline, as will their ability to source food that is justly grown and culturally suitable. According to Najma Sadeque (2014), in the words of the Minister for National Food Security and Research, "It has been observed that the Seed Act 1976 does not fulfil the requirements of the modern seed industry". On this statement of the minister Sadeque observes, "True, because it does not help Monsanto, Syngenta, or Du-Pont-Pioneer in its objectives to take over Pakistan's main agriculture through GM seeds. But it also does not fulfil the requirements of our

small farmers' indigenous seeds geared to the domestic market. On the contrary, it actively deprives the small farmer through ordinance or legislation."

Furthermore, by giving precedence to the rights of corporate plant breeders and the protection of foreign or genetically modified varieties, and by failing to recognize the role of farmers in developing and conserving genetic material and contributing to valuable traditional farming knowledge, a detrimental power dynamic will be created in which the socio-economic and political status of farmers will be further weakened.

According to Kuyek (2001), PBR legislation threatens Asia's agricultural heritage, which has been built by centuries of free exchange of seeds and knowledge, leading to farmer-led, agricultural innovation. The legislation also goes against the tradition of there being no patents on life forms because of ethical frameworks regarding respect for nature, and because anything within nature should be regarded as a discovery rather than an invention. The heightened risk of bio-piracy from the new legislation cannot be ignored, whereby corporations can exploit the weak regulatory and registry systems by securing protection for seed varieties that already exist.

Dwindling biodiversity as a result of mono-cropping will also contribute towards numerous environmental and health issues. According to Azra Sayeed (2016), "The vast array of genetic resources is critical to the survival of ecological zones and systems. The myopic intervention in the agriculture system can result in widespread disease and disaster as seen in the Bt cotton harvest season in 2015."

Moreover, the environmental hazards arising from untested GM seed imports as well as their accompanying herbicides cannot be overlooked.

Comparative Trends: Ecuador, Bolivia, and Europe

South American Countries like Ecuador and Bolivia constitute instructive examples of efforts made by governments towards more environmentally-friendly food policies. These policies rest on the concept of the Rights of Nature:

> Rather than treating nature as property under the law, rights of nature acknowledges that nature in all its life forms has the right to exist, persist, maintain and regenerate its vital cycles. And we - the people - have the legal authority and responsibility to enforce these rights on behalf of ecosystems. The ecosystem itself can be named as the defendant. (The Rights of Nature 2016)

Accordingly, in December 2010, the National Congress of Bolivia voted to support the historic "Mother Earth" Law, which is thought to set the precedence for legislation that treats nature as a legal entity with legally enforceable rights. The principles under the law include that of collective good (prevailing interests of society), guarantee of regeneration, respecting and defending the rights of Mother Earth and anti-commercialism which means that neither living systems nor processes that sustain them may be commercialized, nor serve as anyone's private property (Neill 2014).

Subsequently, in 2011, the Bolivian President Evo Morales signed a new law which set out to ensure food security for his country by safeguarding biodiversity and protecting local varieties, as well as ending dependence on foreign seed companies. This legislation was a response to protests regarding food shortages and increased prices, leading many Bolivians to forgo their staple food in lieu of cheaper foreign products. Under the plan, state-owned seed and fertilizer companies would be set up, small farmers would be given credits, the improvement of local genetic stock through natural selection would be promoted and GM seeds would be restricted based on fears of contamination of local species and higher food prices ('Bolivia moves to end dependence on foreign seed firms' 2011).

Similarly, Ecuador also incorporated the Rights of Nature in its legislation and became the first country to recognize these rights in its Constitution in 2008 by including a chapter on Rights for Nature. Article 71 of the Constitution states:

> Nature, or *Pacha Mama*, where life is reproduced and occurs, has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes. All persons, communities, peoples and nations can call upon public authorities to enforce the rights of nature. (Constitution of the Republic of Ecuador)

Article 73 further goes on to state:

> The State shall apply preventive and restrictive measures on activities that might lead to the extinction of species, the destruction of ecosystems and the permanent alteration of natural cycles. The introduction of organisms and organic and inorganic material that might definitively alter the nation's genetic assets is forbidden. (Constitution of the Republic of Ecuador)

These rights, if tampered with, have to be restored, with citizens having the right to advocate on the Earth's behalf.

The European Union provides strict guidelines and a legal framework for the responsible and safe authorization of GMOs, including high-standard safety assessments, risk assessment, clear labelling of GMOs to enable informed consumer choice and the traceability of GMOs placed on the market. Moreover, GM-free labels are not restricted, provided that they are accurate. Additionally, the EU allows member states to opt out of the cultivation or food and feed use of GMOs even if they have been authorised by the EU. Accordingly, 16 out of 28 EU member states were said to have opted out of GMO usage in 2015 (Sifferlin 2015).

Comparative Trends: The Case of India

Keeping in mind the shared past of the two countries, as well as their climatic and agricultural similarities, it is pertinent to study the case of India while discussing the matter of seed politics in Pakistan.

In comparison to Pakistan's proposed PBR legislation, the Indian Protection of Plant Varieties and Farmers' Rights Act 2001 is more farmer-friendly in a number of ways (Rana 2014). Not only is their Plant Registry governed by an Authority that includes agricultural academics, local seed company and provincial representatives, as well as members of women's organizations, farmers' organizations and tribal organizations, but the Registrar of the Registry is also selected by that Authority and not by the government. Its explicitly farmer-friendly policies include the protection of farmers against unintentional infringement as well as protection against crop failure by compensation for a variety that fails to deliver. Furthermore, the Act states that "the farmer who is engaged in the conservation of genetic resources of land races and wild relatives of economic plants and their improvement through selection and preservation shall be entitled in the prescribed manner for recognition and reward from the National Gene Fund; Provided that material so selected and preserved has been used as donors of genes in varieties registrable under this Act" (Indian Protection of Plant Varieties and Farmers' Rights Act 2001).

It also waives fee payment from farmers for proceedings before the Authority, in addition to expressing the indisputable right of the farmer to save and re-use seeds. It thereby states that farmers are entitled to save, use, sow, re-sow, exchange, share or sell their farm produce, including seeds of a registered variety, provided that the branded seed of a registered variety cannot be sold, where branded seed means "any seed put in a package or any other container and labelled in a manner indicating that such seed is of a variety protected under this Act" (Indian Protection of Plant Varieties and Farmers' Rights Act 2001).

With regards to Indian seed legislation, much has been made to amend the India Seed Act 1966 with a Seed Bill 2004, which has persisted through the years despite resistance stemming from its clauses dealing with GM seeds (GRAIN 2005). The Bill makes provisions for compensations to farmers when registered seeds fail to provide the expected performance promised by the sellers, as well as for cancellation of the registration of a seed that is commercially exploitative and endangers public interest, health of humans, animals, plant life as well as the environment.

This is not to say that India has successfully thwarted the designs of corporate agriculture giants to profit from the fertile lands of their part of the world, especially through GM technology. The growing dissent on India's cotton belt and the strong presence of companies like Monsanto presents clear evidence of that, as well as the Government of India's National Biotechnology Development Strategy (NBDS) 2015-2020 to establish the country as a world renowned biotechnology hub ('India launches new biotech strategy' 2015). However, in India, there is certainly greater awareness and organized resistance to corporate agriculture led by Indian civil society organizations, academics, farmers' associations and the wider Indian public.

Most pervasive of the resistance movements is perhaps the one spearheaded by the leading Indian environmental scholar and activist Vandana Shiva, who started the organization Navdanya in 1987 to combat the corporatization of seeds and to fight

for farmers' rights while promoting biodiversity and organic farming. It advocates for seeds as commons, and the right to freely save and share them, thereby conserving traditional knowledge, culture and biodiversity. A women-centred movement with a primary membership of more than 6,50,000 farmer families, Navdanya comprises of a network of seed keepers and organic producers spread over 18 Indian states, 122 Community Seed Banks (CSBs), a biodiversity conservation and organic farming learning centre with its own farm and seed bank which preserves several important varieties and landraces, and more than 5000 "Jaiv Panchayats" in different parts of India. These are essentially village councils that have Community Bank Registers (CBRs) wherein they register the diversity and knowledge that exist in their village. Additionally, by including women, children and minority communities instead of just individuals on the electoral rolls of the village, these councils empower the community as decision-maker on biological diversity conservation. In addition to creating awareness about the hazards of GMOs and biopiracy, Navdanya also lists as its achievements, training over 5,00,000 farmers on seed sovereignty and sustainable agriculture, transferring 2,00,000 farmers to organic farming practices and conserving 3,000 varieties of rice.

Apart from Navdanya, there are several other civil and voluntary organizations that operate successful Seed Banks in India. These include seed banks by Annadana Seed and Soil Savers, Centre for Indian Knowledge Systems (CIKS), Green Foundation, Deccan Development Society, Sahaja Samrudha and Debal Deb's seed bank, Vrihi, in India's Odisha state. Additionally, community or regional seed banks are also present through the government seed corporation in India, the National Seeds Corporation (NSC), under which a SAARC seed bank is also maintained. Moreover, useful farmer and seed online portals are provided by the Indian Government in the form of "seednet.gov.in" and "farmer.gov.in," where farmers can access information relating to quality seeds and other input availabilities, market prices, crop and risk management, and seed dealers relevant to specific states and districts.

In Pakistan's case on the other hand, while some organizations such as Roots for Equity and PKMT (Kissan Mazdoor Tehreek) do work for community seed-saving, the spread of seed banks and a broader movement for seed and food sovereignty remains limited. As the Guardian reports, "numerous aid agencies, such as Action Aid and Concern Worldwide, saw seed banks as a prompt and effective way to distribute seeds to normalise household conditions after the floods in 2010. However, despite protests and activism, seed banks are still not seen as a long-term solution in that part of the world – primarily due to tenancy farming or feudalism (particularly in the south)" (Jaffery 2014).

Concluding Recommendations

This paper has sought to raise key concerns regarding the contemporary policy landscape of seed, food, and agriculture in Pakistan. It has highlighted the continuities between the earlier "Green Revolution" and the current "Gene Revolution" in terms of its emphasis on a modern agriculture that claims to address food security, but in

effect, produces devastating consequences for the land and worker alike due to its prioritization of the interests of corporatized, high-cost, seed businesses at the expense of the needs of the land, the farmer, the consumer and the citizen in general.

The new legal regimes in Pakistan regarding seed and agriculture – as represented in particular by the Seed (Amendment) Act 2015 and the Plant Breeders' Rights Act 2016 – are deeply problematic as they not only display a glaring disregard for farmers' rights as well as for our national seed heritage, but openly trample on them in order to facilitate a hasty proliferation of commercial and especially GM seeds. The Seed (Amendment) Act bars the use of unbranded seeds, which means that the small, subsistence farmer will be forced to grow only seed that has been officially registered after a series of costly and complicated requirements have been fulfilled. This raises the cost of access and agriculture for small and subsistence farmers, potentially heightening their dependency on rich farmers who will be able to afford the newly protected and registered varieties. The Act further imposes excessive financial penalties and imprisonment for those growing "misbranded seeds," where misbranded seeds are defined in a wide-ranging manner thus opening the path for victimizing the small farmer for growing her or his own seed.

More fundamentally, this kind of monopolization of "true" seed and normalization of "branded" seeds goes against millennia of agricultural practice, whereby farmers have sowed, saved, reused, exchanged and innovated on seeds using traditional knowledge. It also goes against the idea of nature and seed as the "commons" – a shared global heritage that cannot be reduced to the individual property of a seed company.

Farming communities not only ensure the food supply for the whole country – and indeed, for our exports – but have also historically served as stewards of nature, land and biological diversity. It is a duty and moral imperative for the government to represent and protect the needs of this critical, already vulnerable segment of the population, instead of pandering to corporate interests. It is important to highlight that protecting farmers' rights should be a higher priority of the government, and that this prioritization does not mean that the needs of private companies and intellectual property concerns are completely unattended. As the comparative cases of contexts such as India and Ecuador have shown, the rights of nature, seed, and small and marginalized farmers can be effectively balanced with those of private, seed-selling companies.

The Plant Breeders' Rights Act 2016, however, does not even aim for such a balance, and fails to recognize that plant breeders' rights should not supersede those of farming communities. The Act is of grave concern because it seeks to facilitate the entry of GMOs in the market without having set up the proper mechanisms for their safe examination and testing. There is no documentary evidence that the Plant Breeders' Rights Act 2016 as well as the Seed (Amendment) Act of 2015 have provincial approval – as agriculture is now a provincial subject under the 18th Amendment to the Constitution. As such, both these new federal laws not only infringe on farmers' rights, but are also effectively unconstitutional in terms of procedure and jurisdiction.

Finally, as citizens and dwellers of the land, it is important to challenge the very logic of allowing intellectual property rights on seed and crop varieties. Any variation on a plant can be seen at best as a modification, not an "invention" that can be patented, protected, and sold as if it was a mechanical device. This is because such an "invention" will always be based on the biological diversity of seed which is a common, global inheritance, and any attempt to patent amounts to appropriating and commodifying this shared heritage as an exclusive product of one company. Indeed, this biological diversity has been developed and preserved by the very farmers whom the new legal and property regimes of agri-tech companies combined with governments now seek to displace.

In light of the key discussion points and arguments presented in the paper, the following recommendations are suggested:

I. A comprehensive national agriculture policy should be formulated which supports the rights of small farmers and women farmers, fair land reforms, and market price regulations. The policy should also counter exploitative practices in agriculture by old feudals and new agri-businesses alike, and enable provision of affordable and good quality inputs for farmers.

II. The agriculture policy should address food sovereignty as well as the protection and documentation of traditional knowledge of agriculture. Seed banks – state, farmer-run, private, or NGO-led – should be supported.

III. Farmers and farmer organizations should not only be represented and included at the policy and decision-making level provincially and federally, but also have a defining role in the making of any laws pertaining to agriculture and the environment.

IV. The Seed (Amendment) Act as well as the PBR legislation should be withdrawn, and rethought with the active input and prioritization of the needs of small farmers including women farmers. Any future PBR legislation should protect farmers against unintentional infringement and contamination. To develop such legislation, an advisory board should be created that includes provincial officials, farmers and farmers' associations, academics, local seed providers, agricultural experts, NGO representatives and civil society members.

V. Media coverage – television, print, electronic or social – should be increased to highlight the plight of farmers, food sovereignty issues and legislative processes.

VI. Complete transparency should be ensured by the state regarding agricultural legislation, deals and decision-making.

Acknowledgement

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RABIA EZDI

THE POLITICAL ECOLOGY OF BUILDING TECHNOLOGY
IMPACT OF TIMBER SYPHONING ON VERNACULAR ARCHITECTURE IN CHITRAL

Abstract

Vernacular construction technologies are dependent on the political ecology of the regions where they are practiced. In the case of Chitral, a region in North-West Pakistan with high-magnitude seismic activity, earthquake-responsive vernacular technologies[1] using timber-frame structures have been the norm for several centuries. Diyar (cedrus deodara), a locally grown timber with structural strength, durability, and other construction-appropriate qualities has been the traditional construction timber in main Chitral. Today however, due to widespread deforestation, and syphoning of diyar by timber mafia, wherein this wood is smuggled for commercial interests as a high-demand consumer product for the urban construction industry both country-wide and in some cases region-wide[2] use of diyar in Chitral is in decline. As a result, the traditional earthquake resistant timber-frame construction method is seeing a downward trend, leading to weaker structures hence greater damages to homes such as those observed during the October 2015 earthquake. This paper is based on a survey of the changes in vernacular architecture conducted in April 2016 in three villages of the Chitral valley.

Introduction

Vernacular architecture is defined as '…the dwellings and all other buildings of the people. Related to their environmental contexts and available resources, these are customarily owner- or community-built, utilising traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies, and ways of living of the cultures that produce them. They may be adapted or developed over time as needs and circumstances change' (Vellinga et al. 2007).

In simple terms, vernacular architecture is the architecture of the people, designed and built by communities, families, and self-builders (May 2010). The vernacular architecture of any region therefore undergoes change and transformation, similar to all human processes. It is therefore not restricted to a single typology, construction 'style', or building technology, but is a phenomenon that undergoes change and transformation amidst changing socio-economic and ecological contexts. It is this phenomenon and its related impacts that this paper aims to examine through a study of vernacular architecture of Chitral.

Over the centuries, the house form and technology of the Chitral region has fulfilled three essential conditions- thermal efficiency in a climate dominated by a harsh winter, earthquake responsiveness through traditional construction methods, and affordability by a largely low-income populace. Today, this is undergoing a transformation in the new political ecology of the region.

Chitral: Development and Context

Pakistan's Chitral region lies within the high Hindu Kush mountain range in the northern province of Khyber Pukhtunkhwa (KP). The region has a rich history; and has undergone Chinese, Arab, Greek and Persian influences (Dani 2001). Until 1895 Chitral was a fully independent monarchy, and during British rule was negotiated as the 'Princely state of Chitral'. In 1969 the region constitutionally became part of Pakistan.

Administratively, today it forms District Chitral, the largest district of the KP province, has a current population of 447,362 (Census 2017) and covers a land area of approximately 14,850 square km. Characterised by a cold composite climate, Chitral is bordered by the Wakhan corridor along its north, Afghanistan to it west, Peshawar to its south, and Gilgit-Baltistan to its east. Until 2013, the main south-north access into Chitral was either via the Lowari pass. Access is now via the recently completed Lowari tunnel although during months of snowfall, this is substantially reduced. This means both the flow of goods and people follows seasonal patterns and variations. Chakdara and Peshawar to the immediate south are the nearest urban centres serving as local markets for Chitral. Chitral City is the main urban centre with Chitral River or Kunar River running through the valley, majority of villages are compact settlements located on alluvial fans or along mountainside terraces river terraces. A network of canal supplies water for irrigation to a large number of villages, while ground water is the main source of potable water. Electricity in Chitral is supplied via the national grid and is low voltage and intermittent, the current total supply being 8-9MW (Interview with District Forest Officer 2016).

Agriculture is the major source of livelihood in Chitral with ninety percent of the population being farmers, and the rest employed as small-scale traders, government officers, or in the armed forces such as Chitral Scouts and Frontier Constabulary. Livestock is owned by the majority of families largely to fulfil subsistence needs. The area's main crops are wheat, maize, barley, and paddy, as well as vegetables and fruits such as apricot and walnut. There are three distinct religio-cultural communities, the *sunni* majority, the *Ismaili*, and the *Kailash*.

Among current demographic trends, the area is witnessing an internal population growth as well as a population influx from surrounding regions such as Upper Chitral and Afghanistan. This is leading to added pressures on land and the sub-division of agricultural land for housing, resulting in a population densification and an increase in land prices. The recently completed construction of the Lowari tunnel has increased possibilities of migration and trade into Chitral. The latter includes food items, consumer goods, as well as building and construction materials.

The Chitral region falls in Pakistan's seismic zone-4, denoting high magnitude seismic activity (Figure 1). Chitral was among the worst affected regions in the October 2015 Hindukush earthquake measuring 7.5 on the Richter scale. The earthquake resulted in greater damages to homes and structures than lives (Figure 2.). According to local accounts, a large number of lives in this case were saved as the seismic pattern exhibited lower frequency tremors during the first seconds, allowing enough time for locals to vacate buildings, while the earthquake amplified in the ensuing few seconds.
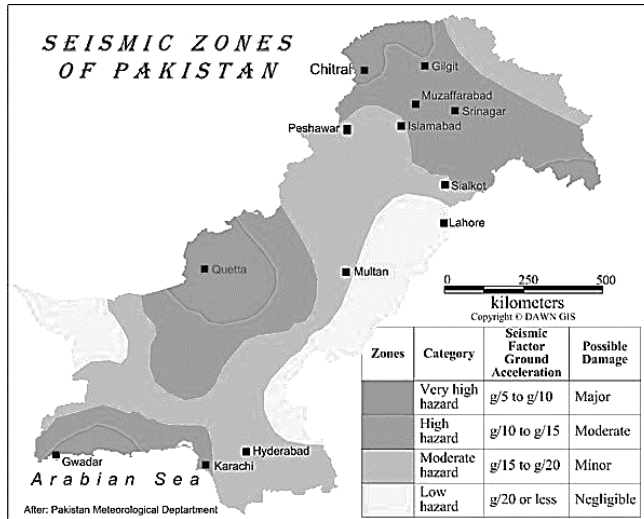

Figure 1: Seismic zones of Pakistan (Source: Pakistan Meteorological Department)

Figure 2: Earthquake affected Union Councils of Chitral, Afghanistan-Pakistan earthquake October 2015 (Source: UNFAO)
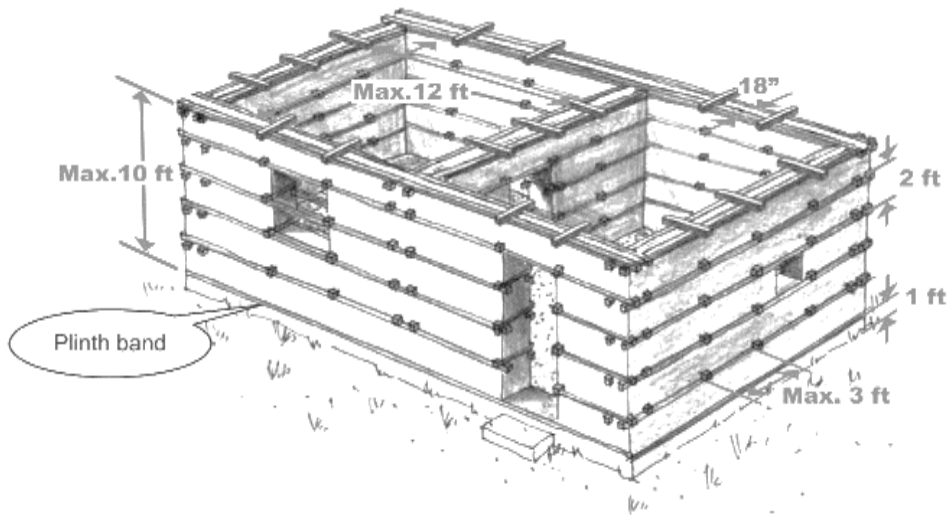
Figure 3: Traditional *grein* technique or timber reinforced masonary
(Source: An illustrated guide for craftsmen, SDC,FRC, in collaboration with UN-Habitat, ERRA 2007)

Seismic Response in the Vernacular Architecture of Chitral

In seismic zones of south Asia which include Chitral, Gilgit Baltistan, Kashmir, as well as Northern India, Nepal and Tibet wherever timber is available a 'confined structure' principle of construction is followed. In this system the building structure is 'braced together' by means of a series of horizontal wood beams and tied at wall corners to vertically latticed cribbage columns. In Chitral, the *bhattar* or *dhajji*[3] technique, is known as '*grein*' is employed, where a repetition of horizontal timber bands creates a frame around the building (Figure 3). These are in turn tied within, and with vertical cribbage-work acting as reinforcement at the meeting points between walls. This construction technology is appropriate to the Chitral region and uses *diyar* (cedrus deodara)[4] wood for the frame as it provides both flexibility and strength to the structure in the instance of tectonic activity. Within timber planks, an in-fill of dry stone is laid, and plastered with locally available mud. The roof is traditionally also designed as a mesh of timber members, often supported internally with an extra arrangement of columns. A thick layer of mud is then laid over this roof, to act as insulation, considerably reducing heat losses from the building during winter months. (Figure 4).
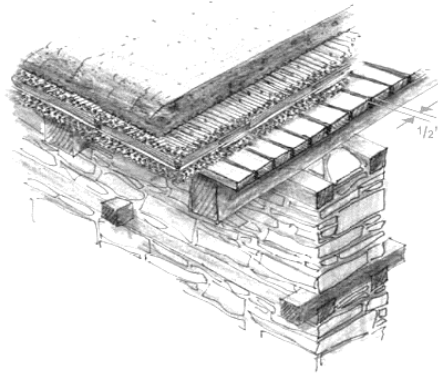
Figure 4: Diagram of traditional roof (Source: An illustrated guide for craftsmen, SDC, FRC, in collaboration with UN-Habitat, ERRA 2007)

It is not only earthquake-responsiveness that is a requirement of vernacular architecture in the Chitral region, but the essential partner requisites of the affordability of construction methods, and thermal comfort accorded via these to occupants in indoor spaces where heat losses in the harsh winter must be reduced. In terms of space usage, the majority of house spaces are multi-purpose. Also importantly, the home is not only a residence, but also a place where livelihood-related activities are carried out. Families live in the extended or 'joint family' mode, where the traditional house plan type is known as '*baipash*' (Figure 5).
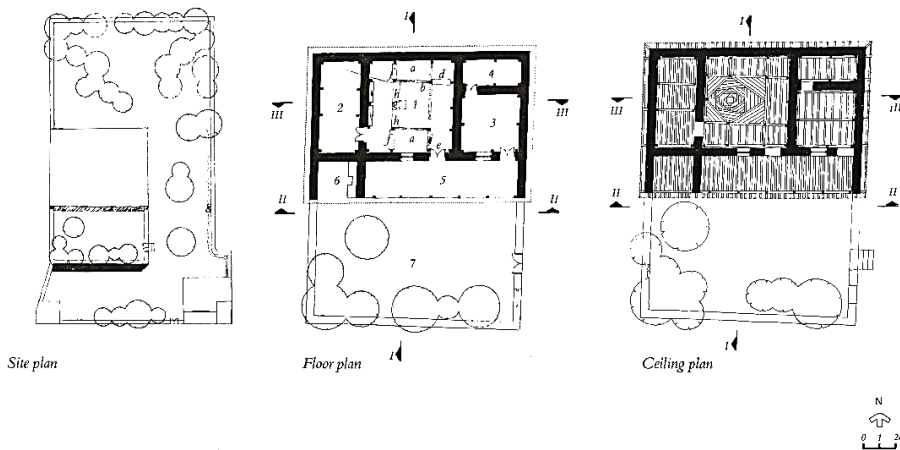

Figure 5: *Baipash*- the traditional Chitral house plan
(Source: The Indigenous architecture of Chitral'; Study by National College of Arts, Lahore, 1980)

Vernacular architecture typically responds to the most extreme conditions of climate in the region where it is located. For Chitral, it is the harsh winter where snowfall is

prevalent and night time temperatures may drop to -12^0 C (Climate-data org.). Thermal comfort for building occupants implies internal temperatures in winter which, after the heating of a space with *bukhari*[5] (firewood heaters) are able to retain this heat for longer periods of time with minimum quotient of heat losses. This is possible only if the building envelope has a high thermal mass allowing internally created heat to be retained, typically possible by the use of building materials with good insulation properties.

Qualities of *Diyar* or Cedrus Deodara

In 1975, Chitral's forests (Fig. 6) where the two widely occurring woods are deodar (*diyar*) and oak, were declared protected. *Diyar* or deodar (cedrus deodara) or Himalayan cedar is an evergreen wood belonging to the family of pines. Found in temperate climates such as that of northern Pakistan, northern India, southwestern Tibet, and western Nepal, it grows at altitudes of 1,500–3,200 m. It has historically been used in the construction of homes and community buildings such as temples. During the British colonial period, *diyar* wood was used extensively for the construction of barracks, public buildings, bridges, canals and railway cars (McGowan 2008).

Because it is a durable fine-grained wood with moisture-absorbing qualities, it is appropriate as a structural material in home construction in Chitral. The wood is also rot resistant and insect repellent. Other locally grown timbers are inappropriate for these uses. At the same time, the durability and strength of *diyar* makes it a high-demand finishing material in the high-end urban construction market down-country. The Chitral *diyar* is particularly valuable and fetches a high price in the market because it is timber of a dry temperate region, therefore contains less resin and its inner structure contains closely packed grains.

Timbers such as *diyar* are provided to the local populace by means of 'timber permits' obtainable through the forestry department, whereby each provincial District is allotted a certain maximum 'quota' for timber for the construction purposes of the local populace. This practise whereby indigenous peoples worldwide are accorded rights over the subsistence use of forest timbers has been protected through the 'Indigenous and Tribal Populations Convention 1989'[6] .

Shifts in Vernacular Building Practices in Chitral

Survey of the seismic resilience of vernacular structures in the Chitral region in April 2016, revealed that much of the vernacular building tradition in this region is in the process of being lost. The primary cause behind this is a reduction in the practise of these technologies due to the lack of local access to affordable timber, leading to the gradual elimination of traditional seismic-responsive methods. Further inquiry into the causes behind structural damages during earthquakes brings to the fore several essential facts.
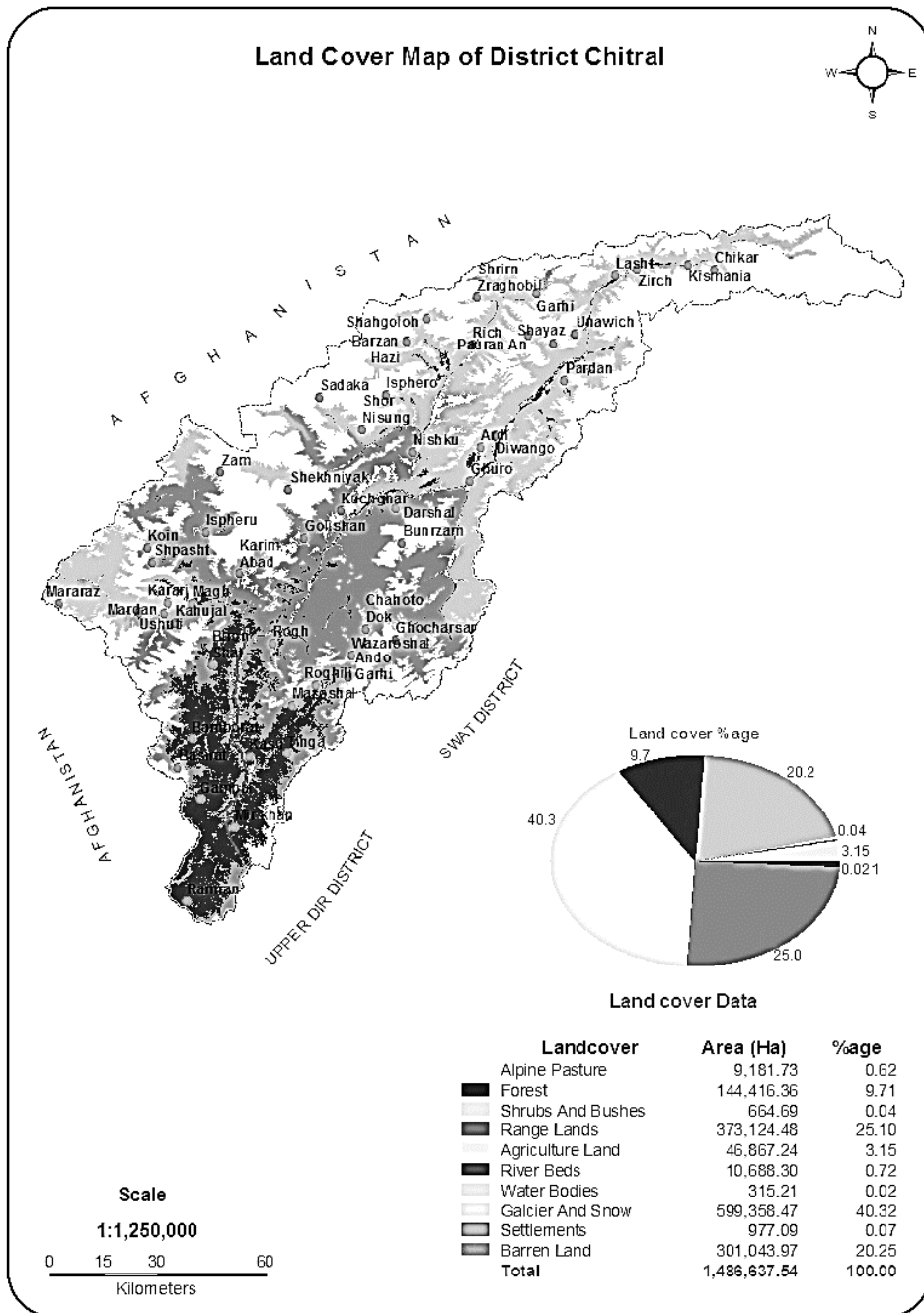
Figure 6: Land cover map of District Chitral (Source: Forestry, Environment, and Wildlife Department, Khyber Pukhtunkhwa)

Basically decisions regarding building construction by lower-income local populations are based on affordability. Non-local building materials include industrially produced steel and CGI (Corrugated Galvanised Iron) imported from down-country (eg Peshawar) and are expensive. Local building materials are procured from raw nature itself; mud may be dug out from the home site itself, local stone such as slate may be quarried from the mountain-side and transported by a local dealer, similarly sand may be extracted from the river bed. However, these vary across Chitral in their quality, availability, and appropriateness for construction purposes. Gradual transformation in the traditional vernacular architecture of Chitral is worth analysing. The new or 'contemporary' vernacular employs a range of industrially produced materials and technologies (typically referred to as 'modern' materials). The most impactful of these has been the introduction of the CGI roofing system. Roughly over the past decade and a half, the CGI sheet has gradually overtaken the timber-mud roofing system in Pakistan's northern regions (Figure 7). Although CGI is more effective than the traditional timber roof with respect to its water-draining quality and is light weight, it results in a high quotient of heat losses from interior spaces due to its extremely low thermal mass. This is highly inefficient in the winter months, as in order to recreate thermal comfort for home occupants, a larger amount of firewood must be consumed to keep interior spaces warm. This leads to a greater need for firewood and/or coal as fuel, for example in the use of the *bukhari* heater. Building materials and technologies such as the CGI sheet although apparently low in capital cost, carry high operational costs for the built structure and its occupants in the long term.
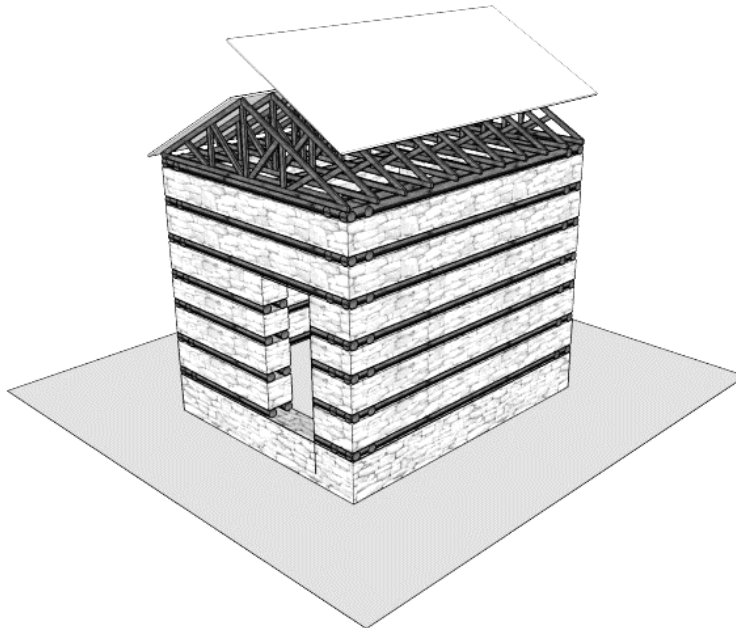

Figure 7: Typical structure of a contemporary vernacular home with CGI roof (Image render: Misqal Mujahid and Umer Ahmed Sher)

Concurrently, the inability of local populations to afford *diyar*, is leading to a loss of the *grein* construction technology which is being replaced by dry stone masonry interspersed with lose timber beams at best. This alternative fails to follow the structural principle of horizontally 'tied'-beam reinforcement, resulting in a weak structure that is unable to bear tectonic shocks during earthquakes.

Important to note, another cause for the 'changing' traditional vernacular are the new trend-setting practises. Home is not only a receptacle for living, but an expression of one's aspirations and socio-economic standing in society. This is tied more to perception and human psychology than rationale. It is generally the wealthier homes in any region- urban or rural that set the trend for what is desirable in terms of the 'iconic' value of the home. In terms of socio-cultural values, the home employing newer industrially-processed materials 'represents' greater 'progressiveness' of the house-owner.

The rich who can afford construction, regardless of its cost and thermal mass are in the process of employing contemporary construction methods already. In addition to the CGI-sheet technology, Reinforced Cement-Concrete or RCC is increasing in use. Traditional vernacular methods are increasingly perceived as 'archaic' and the standard of 'development' is set by the richer 'noblity'.

Out of the three necessary requisites of locally appropriate construction technologies, ie seismic resilience, thermal comfort, and affordability- contemporary technologies mentioned above meet at most one or two of the three. Further, changing construction technologies have secondary impacts, one of which is the changing house plan. From the traditional *baipash* the home is transforming to one that has more built-up space and fewer intermediary spaces such as the veranda. Secondly, the roof is no longer the traditional flat roof but the pitched CGI roof hence no longer allowing for the use of the roof top as a space for economic activity such as the drying of agricultural produce. Thirdly, the main multi-purpose family room is being gradually replaced by a larger number of segregated or single-use rooms, also due to transformations in culture and systems of living.

Building Performance in 2015 Earthquake: the Case of Jhoghore, Bhumburet and Garam Chashma

During a survey in April 2016, three earthquake-affected locations of District Chitral were surveyed, with reference to i) earthquake-related damages, ii) construction technology and iii) material availability and use. These were: village Jhoghore, villages in Bumburet, and village Xetur in Garam Chashma. The majority of local populations here are lower income families with average household size of eight persons, typically including ageing parents living with one son and family. While some are subsistence farmers, a large majority are agriculturalists selling surplus produce to the market.

Village Jhogore was one of the worst affected areas during the October 2015 earthquake. It is located several kilometres from Chitral city. While the traditional timber band or *grein* construction has been the norm here, this is fast disappearing as locals claim that for newer homes or home extensions in the present time, *diyar* has become unaffordable. Also, the official timber permit system is not reliable according to locals. For the most part, homes in Jhogore were damaged during the earthquake as these did not employ the timber-frame method, with the majority of damaged structures being built in dry stone with mud plaster. In the case of Jhoghore, this mud is of low quality as it does not have the required elasticity or adhesive strength needed to perform appropriately in the form of either plaster or mortar. Wealthier homes in Jhoghore hence purchase higher quality mud from village Bakrabad located roughly 6 km from Chitral city, while the less able to afford make do with low quality mud.

Bumburet region lies in a remote valley accessible via an under-maintained dirt road only by jeep. Settlements exist in the form of villages and hamlets, inhabited largely by *sunni* and *Kailash* communities. Bumburet is still relatively replete with *diyar* forests though these are in the process of being depleted; local access to the timber is still relatively adequate but this scenario is slowly undergoing change.

According to locals homes in Bumburet were destroyed during the flood of July 2015, but the October 2015 earthquake did little damage to structures. The cause behind this is evident when observing vernacular construction methods in the villages of Bhumburet. Here, the *grein* or traditional wood-frame method is still widely practised. Both in construction technology type and the quality of this craftsmanship, the vernacular homes of Bhumburet are far superior to those observed in Jhogore. The CGI roofing system has not infiltrated Bhumburet to the extent seen in other regions of Chitral, hence the traditional method has also maintained thermal comfort levels for this harsh cold climate.

Garam Chashma is another remote valley of Chitral. Located at an altitude of 8366 feet the region is settled by villages and hamlets. A relatively well-kept dirt road is the main access to this region. Here, *diyar* forests do not exist, as this timber does not grow wild at the high altitude of Garam Chashma. The main local wood typically used for construction purposes is poplar. While the prevalence of industrially produced building materials such as steel is observed along the main road and main access areas, this was far less the case in the remote villages of Garam Chashma such as Xetur. This is because the transport of non-local industrially produced material into remote areas is both costly and challenging.

Forest Management Systems and Local Access to *Diyar*

Global developments in forest management have taken place in the past decades in response to forest degradation and a growing understanding of the role of forests in biodiversity and ecosystem services such as climate regulation and groundwater recharge. Also, deeply tied to forests are local communities and their basic needs such as firewood, timber for construction, and pasture for the grazing of livestock.

The finer details of forest management in the Chitral region therefore have a direct impact upon the local community's welfare and their access to timber in meeting their basic needs.

In Pakistan the state regulates all forests. Pakistan's forest management laws and procedures have been inherited from those formulated by the British, with the first formal forestry policy being issued under British administration in 1894. A forest legislation was made in 1878, to control logging. The Indian Forest Act 1878 gave the government control of the majority of forests, while granting limited rights to local communities. With protests by locals in the following years, a Forest Act was promulgated in 1927, granting villagers more control of the use of forests (Ahmed and Mahmood 1998). Forest policies were developed and amended by the Pakistan government in 1955, 1967, 1975, and 1991, with the 1990s seeing a series of progressive reforms to these regulations[7]. The current Khyber Pukhtunkhwa government has undertaken a proactive role in amending these rules under the Khyber Pukhtunkhwa Protected Forest Management Rules 2005.

In 1992, a ban on the commercial harvesting of timber was imposed. In 2003, this ban was partially lifted, whereby the commercial harvesting of 'dry and wind-fallen trees' was allowed. The present Khyber Pukhtunkhwa government has put an end to the 'dry and wind fallen' policy. The cutting of dry standing trees by the Forest department is permissible, while the ban on the logging of 'green trees' remains intact. A 'scientific forest management' system has been restored, meaning that timber may be harvested by the Forest department 'as per working plan prescriptions (Interview with forest district officer 2016).

While the commercial harvesting of timber by law ensures royalty to forest dependent communities, it also opens the way for greater exploitation by means of illegal logging by the 'timber mafia' (see below). While formal policy aims at managing forests for the public benefit, this is not always so in practise (Ahmed and Mahmood 1998).

Land tenure and legal classifications of forests include two broad categories: State forests, comprising 66 per cent of total forests in the country, and privately owned forests which comprise 34 per cent of all forests. Of State owned forests, there are a further four categories, namely reserved forests (public forests), protected forests, unclassed lands, and resumed lands. Forests categorized as 'Protected' in Khyber Pukhtunkhwa (then 'NWFP') were inherited by the government of Pakistan from the princely states of Chitral at the time of accession in 1969 of the country's privately owned forests, there are five categories namely *Guzara* forests, Communal forests, Chos Act areas, Section 38 areas, Farm forest areas (Yusuf 2006).

Aside from government, the key stakeholders of *diyar* are local communities and the 'timber mafia'. While the former requires timber to meet domestic and subsistence needs (such as firewood, pastures for the grazing of livestock, and construction), and the latter logs timber for high commercial profits and business returns.

While the needs and interests of local communities viz access to *diyar* are relatively clear, the identity and operation of the so-called 'timber mafia' is a covert phenomenon for reasons that are evident, as this group operates by evading law and its processes. Although an in-depth enquiry into the workings of timber smuggling is beyond the purview of this research, it is important to broadly understand the various methods through which the timber 'mafia' functions.

The 'timber mafia' is understood to be a network of powerful local traders involved in the timber industry. According to researchers and media (Ahmed and Mahmood 1998, Shaikh and Tunio, 2014) the operation of the timber mafia involves a strong tie between provincial politicians and forest contractors, with a number of members of provincial assemblies having been forest contractors. This nexus is in turn enabled through collusion between politicians, contractors, and government officials that forms this consolidated network known as the 'timber mafia'. This network practises immunity from forest laws through the exercise of power and privilege, and largely employs a free hand in forest procedures and timber logging.

Resident communities and local associations have protested over the years, expressing grave concern over deforestation occurring as a result of illegal logging by the timber mafia. Until 2003, under the Khyber Pukhtunkhwa 'Dry and Wind-Fallen' policy, the harvesting of timber which has dried beyond repair, or fallen due to strong winds, was allowed. Under the current Khyber Pukhtunkhwa government, this policy was banned as it was being severely exploited, whereby the logging of green and living trees was been carried out under the pretext of wind-fallen trees. Also, in general the logging of more timber than permitted, due to contacts with officials, is a general practise by timber 'contractors'.

The law has also declared a ban on the transport of *diyar* out of district Chitral, however this continues illegally particularly during hours of the night. In one instance in March 2006 for example, a truck laden with illegally logged timber was seized by the Khyber Pukhtunkhwa Forest Department, where *diyar* was being smuggled out of Chitral into Afghanistan and southern Pakistan). The truck body had been altered to evade the attention of authorities.

Loss of Earthquake-Responsive Construction Vernacular Methods: Root Causes

The deforestation of local woods such as *diyar* is an undeniable fact. In 2009, total forest cover in Chitral was 4.7per cent (Dawn 2009). At present, there is only 3.4per cent, with a projected reduction of another 23per cent of existing forest by 2030. On the ecological plane, among their vast ecosystem services, forests are known to be essential for the maintenance of watersheds and ground water recharge. However the use of timber for the survival needs of the local populace including the practise of earthquake-responsive construction methods, is an equally important element of the ecology-people equation. It follows thus that forests and their conservation have a direct impact upon the employment of the *grein* (timber-framing) method of

seismically-appropriate construction, their structural strength, and hence the protection of lives during earthquakes.

What cannot be taken for granted are the causes behind this decrease in access to *diyar* for the local populace? As discussed above, the general perception is that due to widespread deforestation, the availability of *diyar* in main Chitral has been curtailed, both by government policy and by default. While this is true, the assumption that a reduced supply of *diyar* resulting from deforestation is solely responsible for reduced access to *diyar* for locals, is an over-simplification. It is not merely the *availability* of the wood in nature, but the access of local populations to it that defines if and whether this timber will continue to be used as a key material in vernacular construction. In this equation, the timber mafia is a major predator.

Also *diyar* wood is a high-demand consumer product in Pakistan's urban centres, where it is used as an interior finishing material in upper-income homes, and as a major material in the furniture industry. Here, a major player in the timber-accessibility equation is the timber mafia, which illegally siphons or smuggles the wood to markets down-country. This leads to a decrease in permit-accessed *diyar* by local communities.

Further as reported by both locals and officials such as District Forest Officer Chitral, it is because locals themselves are now unable to afford firewood and timber, they have minimized its use. The logical outcome is hence evident, where a reduced access to timber for construction, results in an abandoning of vernacular construction methods.

Official Systems of Access to *Diyar*

The right of local communities to access timber is secured through two principal means: i) a District-based quota for the harvesting of timber for domestic and construction needs etc, and ii) 'royalty' for communities from the sale proceeds of commercially harvested timber, making communities concessionists[8] in timber harvesting profits. Pakistan's timber quotas are district based, hence within the same province these will vary from district to district. For the various districts of the Khyber Pakhtunkhwa province, specific 'quotas' of wood have been allocated to meet the needs of local populations. In the case of District Chitral, a timber quota of 1.500,000 cubic feet timber (cft) is allowed by the forest department to cater to the population's timber needs (Interview with District Forest Officer (DFO) 2016).

For a household's construction needs, a local residing the district undertakes a procedure of applying for a timber permit. This is free of cost. Once this application is processed, the forest department officer visits the home of the applicant in order to verify the need. The timber permit is then issued. In the forest itself, the forest ranger marks the tree which is then harvested, using a timber cutting machine to cut the wood in the presence of the applicant, followed by him transporting it to his home.

One timber permit allows for 100 cubic feet of timber to the household applicant. However, employing the *grein* method of construction, this is only sufficient for a maximum of two rooms of average size, while the actual requirement per home is far greater.

Secondly, the government of Pakistan has declared local communities residing around protected/reserved forests as concessionists to these forests. A 'concession agreement' is a grant of rights, land, or property by a government, local authority, corporation, individual, or other legal entity. Pakistan's State legislation declares local communities as concessionists in forests, whereby the community receives an allocated concession or royalty from the sale of forest timber. This makes the community a legal and rightful recipient of a share of 60per cent in the sale of timber from a particular forest. The Forest Development Corporation, a semi-government institution plays a major role in the process, marking trees allowed for cutting, transporting these to the road, and then transporting this timber to the market (for example in Chakdara). Once this timber is sold, its net sale amount is sent to the Forest department. After a deduction of managerial charges from the total amount, the remaining amount is directed to the concerned District Forest Officer. Of this amount, 40per cent is apportioned to the government treasury, while the remaining 60per cent is officially furthered to the regional Deputy Commissioner who is then responsible for forwarding this to the concessionist community. In addition, timber 'seized' by the forest department is also occasionally auctioned by the department. This is a means of legalising an illegal activity.

Informal systems of Access to *diyar*

A parallel 'informal' system operates alongside the official. Within this, groups of opportunists make use of the scarce availability of a resource, profiting by selling to those in dire need of it, or those interested in making monetary gains from it. This is usually done in collusion with officials, supplying the scarce resource which is by definition a 'right' of beneficiaries, in return for money. In this case *diyar* is syphoned from the official system using various underhand means, and sold to those with either desperate needs or those with business interests as mentioned above. The timber 'mafia' falls in the latter.

A number of news reports have surfaced in the Pakistani print media in recent years, touching upon the smuggling of timber in the Khyber-Pakhtunkhwa region. A large number of protests by Chitral locals and community organizations[9] have also occurred regarding timber smuggling, not all of which are reported in the mainstream media.

One method of the timber mafia's smuggling of diyar, is the illegal purchase of timber permits that are 'in process', from their rightful beneficiaries through collusion with government officials. Timber sold in the local 'black market' too is from the quota rightfully prescribed for Chitral locals. For example, an individual

may obtain timber through an officially allotted timber-permit, and sell it in the market at a relatively high price.

Gaps in the Official system of *Diyar* Distribution

Although the government policy of making local communities concessionists in the commercial harvesting of timber aims to safeguard the rights and welfare of locals, it is severely abused by the timber mafia, which secures the logging of *diyar* via the purchase of 'royalty' from communities.

In the words of Chitral locals, the country's political elites that are the 'timber mafia' have purchased royalty from '*ghareeb awam*' (poor locals) at very low prices. The 'mafia' or timber smuggler makes an agreement with the local, through which the 'power of attorney' is transferred to the timber smuggler by the local. In some cases, these agreements were made ten to twelve years ago and the same rates for timber (despite their increase price in the market) are being used by exploitative timber traders today, benefitting from the lack of awareness of poor locals. Hence, for example, while *diyar* is bought from a local for Rs 80-100 per cubic foot, it is sold for Rs 3000 per cubic foot in markets of neighbouring urban centres such as Chakdara (Interview with DFO 2016). In the construction and furniture market further down-country such as in the cities of Punjab, this timber procures even higher prices owing to its quality and rising demand.

Typically, a community gets an advance of cash and routine food items such as sugar, ghee, flour etc from the designated shop of a timber contractor who himself is part of the timber 'mafia' network, in return for their 60per cent share in forest royalty. This is done by means of the community signing an affidavit on judicial stamp paper with the timber 'contractor' (timber 'mafia'), stating that the community or individual concessionist has authorized the latter the 'power of attorney' to obtain their royalty out of the sale of state owned forest timbers. It is in this way that the community in effect 'sell' their royalty, which has been allotted to them by law. Once the actual royalty is distributed from the sale of timber for example in the Chakdara market, the timber mafia produces this affidavit to the District Commissioner Chitral and obtains this royalty on behalf of the community. It is thus that ill-informed poor communities do not procure the actual benefit of the timber royalty, which by design was intended to secure the welfare of impoverished local populations.

Discussion

It is largely the syphoning of the local quota of *diyar*, into timber smuggling for the consumer market that is creating shortages of the wood in the local quota, by extension making it inaccessible for the construction needs of local populations. Of this, damages to lives and property during earthquakes are a direct resultant.

It follows that 'environmental' issues such as deforestation[10] do not exist in isolation but within a web of prevailing systems, economies, politics, and priorities. It is therefore not the deforestation of diyar alone, but the political-ecology of the timber market (the timber mafia included), that controls the 'distribution' of the wood. Here, the government cannot withdraw from the responsibility to guarding the interests of the local populace. With the overarching aim of reducing damages to lives and property during high magnitude earthquakes the government's role in ensuring the access of communities to appropriate and affordable building materials stands to be revamped via policy measures and their reinforcement.

Further the issue of technology 'appropriateness' must remain a key concern. Seismic responsiveness, thermal efficiency, and affordability are the fundamentals of building technology appropriateness for vernacular architecture of Chitral. The absence of any one of these in turn reduces resource-efficiency and bears grave ecological and human repercussions, both in the short term and the long term.

The choices for material or building technology in the vein of environmental 'sustainability' are also not absolute; as discussed above, environment is deeply tied to livelihood, human well-being and the politics of ecology,. Any 'balanced' outcome therefore requires intelligent decision-making based on weighing the costs and benefits of given possibilities. Whereas the consumption of *diyar* in Chitral places a heavy burden on its cultivation and leads to deforestation, other options such as the use of steel for reinforcement of structures for seismic performance, leads to carbon emissions as the production of steel is fuel intensive and waste-emitting. For suitable decisions regarding the choice of construction material therefore, the environmental costs of both must be weighed with reference to their social costs such as repercussions on livelihood, lifestyle, and secondary impacts.

In the absence of transparency and the accountability of all systems and individuals, particularly the powerful and more prone to corruption through an abuse of authority, any policy made for the well-being of communities, environments, and citizens is bound to fall short. At the same time, it is not a utopia that is required, nor is the situation impossible to redeem. Where systems must be transparent and well-meaning for the public welfare, 'pressure' in the form of local watchdog groups, consolidated communities and activists working towards the checking of corrupt practises in timber syphoning are bound to succeed, as has been the case in a number of countries across the world, including Pakistan. At present, locals are seen as the 'threat' by most policies (Ahmed and Mahmood 1998). Secondly, communities are alienated from information and decision making. Government and/or NGO-initiated programs that work for the education of local communities regarding their rights with reference to royalty, as well as their involvement in decision-making processes, can be successful if these go hand in hand with the genuine will to safeguard the greater public good.

Notes

[1] The use of the word 'technology' implies all forms of the technology spectrum, and denotes not the conventional connotation of 'high-tech'

[2] According to locals *diyar* is smuggled from Chitral into Afghanistan and Southern Pakistan

[3] The *bhattar* and *dhajji* terminology originates from the northern areas of Pakistan, particularly from the Kashmir region where it is practised extensively as a timber-bracing method in the construction of homes

[4] *Diyar* is an evergreen wood belonging to the family of pines. Found in temperate climates such as that of northern Pakistan, northern India, southwestern Tibet, and western Nepal, it grows at altitudes of 1,500–3,200 m. It has historically been used in the construction of homes and community buildings such as temples. During the British colonial period, *diyar* wood was used extensively for construction of barracks, public buildings, bridges, canals, railway cars and sleepers.

It is a durable fine-grained wood with moisture-absorbing qualities, the wood is also rot resistant and insect repellent. Other locally cultivated timbers are inappropriate for these uses. Given its structural strength, durability and above all local availability it was the choice wood in traditional building construction in Chitral. The durability and strength of *diyar* also makes it a high-demand finishing material in the upmarket urban construction market down-country. The Chitral *diyar* is particularly valuable and fetches a higher price in the market because it is timber of a dry temperate region, therefore it contains less resin and the grains are closer together and considered more pleasing to the eye.

[5] A '*bukhari*' is a wood or coal-burning stove, used traditionally as a heater for indoor spaces in the harsh winter. Bukharis are commonly used by locals in the northern mountainous regions of South Asia (eg Afghanistan, North Pakistan, and North-east India).

[6] This Convention was framed at the General Conference of the International Labour Organisation convened at Geneva by the Governing Body of the International Labour Office on 7th June 1989

[7] Moeed Yusuf, 28.6.2006, Trends in Forest Ownership: A Legal and Institutional Analysis, presented to Asian Institute of Technology, Thailand

[8] A forest concession is "a contract between a forest owner and another party permitting the harvesting (forest utilization contracts) and/or managing (forest management services contracts) of specified resources from a given forest area" (Gray 2002).

[9] Of these, the NGO Sarhad Awami Forestry Ittehad has been at the forefront of the struggle to secure community rights and forest conservation since 2000.

[10] Deforestation of diyar previously went hand in hand with the purposeful degradation of the forest; in an exploitation of the now-banned 'dry-fallen' policy, mafia workers would purposefully dry out healthy trees in order to gain access to their timber.

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TARIQ ABDULLAH

"ARE THERE BIASES INSIDE CLIMATE SCIENCE? HOW DOES THE DUALISM OF SOCIETY AND NATURE PRODUCE STRENGTHS AND WEAKNESSES?"

Abstract

Climate Science does not deal adequately with the injustices in the framing of the issues of mitigation and adaptation to Climate Change. This is manifested in the growing global climate justice movement. Global Circulation Models (GCMs) lie at the foundation of our understanding of Climate Change and are presented as apolitical representations of the science of climate change. This paper argues that climate science institutions and practices reproduce the dualism of society and nature in many forms including the separation of science from politics. Here the dualism built into the fabric of capitalism can be seen in the separation of science from policy and the institutions of the IPCC from the UNFCCC. Why is this dualism built into capitalism and what are the consequences of this dualism for present day climate science. This paper argues that this dualism manifests itself in both strengths and weakness inside climate science which ultimately present an apocalyptical perspective on global warming. What is the consequence of this apocalyptical perspective. Certain social aspects are hidden from view and the social is represented as a monolithic and undifferentiated entity. This is reflected in the concept of anthropogenic climate change where the social has to be reintroduced into the natural. The contradictions built into this concept appear as climate fetishism with the agency of change oscillating between two poles, the fetishism of GHG molecules and the concept of anthropos as the hypothetical climate machine manager. This paper explores the genealogy of GCM models and how the externalisation of Nature enables Capitalism to engage with the displacement of responsibility. In this way climate science continues to sustain the myth of the irrelevance of global capitalism to the global climate crisis. In particular climate science ignores certain kinds of social and historical distinctions which limit its role as a guide to addressing global warming. This paper explores the contradictions of addressing climate change as a politically neutral process.

Science is produced in a particular social and historical context. That context characterizes the particular historical form that science takes. Science claims universality and objectivity but the owners of these institutions of science in any particular historical epoch determine the shared biases of the community of scientists. Science represents a social product where individual biases may well be addressed and removed in the struggle for objectivity. However, shared biases remain. What is the character of these shared biases in contemporary climate science?

Capitalism has promoted a separation of nature from society. Nature is characterized by scientific procedures which are presented as apolitical and independent of the class

forces and struggles within society. Science is presented a serving the common good and nature is considered as existing external to society. Science is concerned with the representation and transformation of this nature and the production of the non-natural or the artificial in order to satisfy human needs for shelter, clothing and sustenance. Capitalism is concerned with the transformation of use values into exchange values and this process of commodification is directed towards the accumulation of capital (hopefully) without limit. From this alienated perspective the evolution of society has dynamics (economic development) separate from that of natural evolution. The interaction between the social and the natural is described in terms of supposedly exogenous and endogenous processes in each domain. The 'production of nature' perspective considers that this conception of the social and the natural as separately evolving has never been adequate and that its weaknesses are increasingly visible in a world now being described as entering a new geological era called the anthropocene.

The science of climate change as represented by Global Circulation Models (GCMs) and global institutions such as the Intergovernmental Panel on Climate Change (IPCC) have particular strengths and weaknesses as they are the product of a particular social process and its historical context. The strength and weaknesses need to be explored from the perspective of struggles to address climate injustice.

What is the production of nature?

We can begin to grasp production in terms of its negation (non-produced) and nature in terms of its negation (non-natural). In this sense the non-produced is natural and the non-natural is produced. The production of nature appears contradictory. What is natural has been promoted as safe and healthy and what is un-natural has been viewed with suspicion and fear. The ecology movement still reflects this ethos.

How and why have the social and the natural been separated? This separation has enabled the transformation of nature into the environment. Nature once externalized becomes resource, a category reflecting the human domination of nature, as indirectly expressed in the term anthropocene.

Capitalism developed along with a changing relation between the individual and the social. In pre-capitalist societies the actions of individuals were determined by their social positions. Bourgeois ideology portrays individuals as social atoms and the social as determined by the properties of individual human beings. In the Cartesian world physical nature is a reflection of dominant social relations. In philosophical terms the individual is ontologically prior to the social and in the corresponding bourgeois view of nature the part is ontologically prior to the whole. This results in the science of nature being reductionist. The binary of the social and the individual is reflected in nature in the binary of the part and the whole.

What kind of binaries do we see inside science?

Truth and values, facts and theories, social and natural, part and whole, organism and environment, mind and body, individual and the social are all dichotomies engaging with the separation of truth from values, facts from theories, the social from the natural, the part from the whole, the organism from the environment, the individual from the social.

What are the consequences of employing these dichotomies? Natural philosophy was concerned with the true and the false and the good and the bad. Now science has been separated from ethics. Science is concerned with 'facts, the true and the false, where as ethics is now concerned with the good and the bad, morality and values. This separation of ethics from science is constitutive of western science and Cartesian dualism. This is how natural philosophy has evolved into modern science during the capitalist epoch.

How can we explore this dualism?

Nature is conventionally seen as the non-human and non-social. This translates into a non-human nature. Natural science explores this nature and makes claims of objectivity and universality. The social is seen as the human manufactured, that is, as what is produced. The social engages with the artificial or synthetic and in this way humanity creates a non-natural society. Social science engages with human productive activity and this social production becomes the realm of economics, sociology, history etc. As a consequence of this separation of the social from the natural, economics frequently claims to be independent of the environment.

What is the challenge to dualism?

Does science just explore the non-human environment? Obviously not - science explores both the natural and the synthetic. Objects in nature are hybrid, machines in their operations are cyborgs. In this way science engages with produced natures. In this way science engages with produced natures. As a consequence the universality and objectivity of science is increasingly challenged and scientific practice is very much context dependent, embedded, entangled and contingent in character. Scientific knowledge is situated knowledge, this means it is a partial perspective rather than the claimed universality and objectivity of science. Nature is a hybrid, part natural and part social for nuanced description of hybrids and cyborgs see Swyngedouw (2006).

How does the 'production of nature' challenge this dualism?

The "production of nature" concept sees production and nature as an entangled and embedded socio-natural processes. The separation of the natural from the social enables science as an institution to acquire a privileged or authoritative position(as a universal perspective in contrast with situated knowledge and its necessarily partial

perspective).The profession of science is based on a division of labour and reflects and helps reproduce the hierarchical and heterogeneous character of modern society. Economics aspires to become economic science in the image of natural science and to acquire the position of universal knowledge. This enables the economics profession to aspire to a similar position of authority in society. The privileges of scientists and economists create and entrench a distinction between expert knowledge and non-expert knowledge. All social practice provide forms of knowledge but only the practice of scientists enables the authoritative knowledge of climate science.

The production of nature perspective focuses on metabolic processes and challenges the privileged positions outlined above. Metabolic processes consist of both a natural metabolism and a social metabolism. The biogeochemical cycles of the environment are the basis of the natural metabolism whereas the cycles of capitalist production and process of circulation constitute the social metabolism. These metabolic processes are interlinked and interpenetrating in character. A consequence of this is the creation of metabolic rifts and the crossing of planetary boundaries in the global environment.

An example may help make this process clearer. Money has played various social roles in society. One role is the measure of value and storage of wealth. In pre-capitalist societies hierarchies developed to ensure fluctuations in agriculture did not threaten the continuity of social formations. Typically these took the form of granaries which were administered by a privileged class. In many instances the storage of grain was replaced by the role of money as insurance against harvest fluctuations. In today's world money can be seen as helping create food shortages rather than overcoming them (Sen 1982)). The circulation of food and the circulation of money constitute a single process which cannot be adequately grasped as independent processes interacting but fundamentally possessing their independent dynamics.

What kind of injustices relate to climate change? What is the nature of the crisis of global warming?

The atmosphere has been used historically as a dump for the waste products of fossil fuel burning particularly since the time of the industrial revolution. This use of the atmosphere as a dump for greenhouse gas emissions has been a very unequal. Who then, should be held responsible? One kind of climate injustice refers to the issue of mitigation efforts and responsibility. In the Kyoto Protocol (1997), the only global climate agreement requiring mandatory emission reductions this was addressed through the "Common but Differentiated Responsibility" clause. If we compare the GHG emissions of China and the USA today different metrics suggest different levels of responsibility. In terms of current aggregate annual emissions both countries are comparable, but in terms of accumulated emissions China remains far below the US and in terms of per-capita emissions, the difference remains huge. As GHG gases persist in the atmosphere for decades or even longer there exists a severe climate debt from accumulated emissions. The distinction between voluntary emission reductions and mandatory emission reductions in Kyoto (1997) have disappeared in Paris (2015). Under Kyoto countries belonging to the North had mandatory reduction targets

(however small) while countries in the South made voluntary emission reductions. The injustices of climate mitigation efforts have received considerable attention in the research literature on climate change. In particular perverse incentives have been provided in mitigation efforts where value of imitation reduction credits have far exceeded abatement cost (see for example Lohmann 2005).

How are adaptation efforts creating new injustices?

However the injustices of global warming are not just violations of the "polluter should pay" principle. Efforts at adaptation to climate change are helping to create new additional injustices. These include efforts like geoengineering the climate, carbon trading, payments for ecosystem services (PES), Reducing Emissions by Deforestation and Forest Degradation (REDD) and creating of climate-smart crops through biotechnology. For example, the "Fat Cats" in the EU Emissions Trading System (ETS) are large industries that are being subsidised rather than penalised. Other corporations have also made illicit profits from carbon markets by deliberately producing and then destroying a greenhouse gas known as HFC-23, creating pollution rights for the market in the process. But there are still further types of injustices in the way climate change is approached today.

Are there injustices within mainstream climate science?

Science claims to serve the common good. As a result science is portrayed as being apolitical and not serving particular class interests. The separation of science from politics is built into the way climate science institutions have been constructed. The Intergovernmental Panel on Climate Change (IPCC) is mandated to provide the scientific basis of climate change as a consensus science, whereas the United Nations Framework Convention on Climate Change (UNFCCC) and its annual Conferences of the Parties(COPs) are expected to deliver policy recommendations based on this science. However societies are heterogeneous in character and different social classes feel the impact of climate change differently. The concept of a (singular) "environment" is questionable and critics of sustainable development have questioned whose environment is being addressed by the term "our" environment. Addressing climate change requires the building of social alliances and popular movements at a time when the dominant social forces have become addicted to cheap fossil fuels. Strategies for climate activism must recognise the failures of global climate governance and as a part of this recognition must begin to explore the injustices within climate science in order to build the necessary social alliances. Hence the need to recognise the weaknesses and strengths of climate science.

How have GCM models become the basis for climate policy? What is the geneaology of climate models?

Global Circulation Models (GCMs) have become the basis for climate policy. Since the 1970s these models have incorporated an increasing number of processes starting from

CO2 emissions and rainfall to include the effects of clouds, ice, oceans, aerosols, ocean circulation and the biosphere. The IPCC has produced a number of Assessment Reports starting from the FAR (1990) and followed by the SAR (1995), TAR (2001), AR4 (2007) and most recently the 5AR (2015). Parallel to the changes in the Assessment Reports have been the creation of more detailed GCMs. These models divide the atmosphere into horizontal (longitude and latitude) and vertical (altitude) grids and have invoked an increasing number of physical processes as mentioned above. The term anthropogenic climate change can be explicated by comparing these GCM models with and without anthropogenic forcing. The divergence of these model simulations particularly since the 1960s is evidence for human induced global warming.

The genealogy of these models has been described in detail by Paul Edwards in his book entitled "A vast machine. Computer models, climate data and the politics of global warming" (Edwards 2010). This history of climate models is connected to the development of cybernetics in the era of the Cold War, the use of non-linear fluid dynamics in the computer simulation of nuclear explosions, weather modification during the Vietnam War and the emergence of the field of systems analysis after WWII. Historically the link between computer modelling and military needs is apparent.

The dangers of global warming are increasingly being represented in an apocalyptic terms. Extreme weather events are highlighted, sea level rise is predicted, droughts and floods are becoming more frequent. The apocalypse perspective represents the climate crisis as a common crisis and obfuscates the differential impact global warming on different classes in society and on the different ways in which people earn their livelihoods.

How is the climate crisis portrayed as an apocalypse?

More and more scientists are adopting the view that the relationship between mankind and nature should be characterised as a new geological epoch called the anthropocene. It is contended that a number of planetary boundaries that have been crossed or are being approached at the global level. These planetary boundaries are often described in terms of "tipping points" in the global ecology where the crossing of thresholds bring about irreversible and non-linear changes in processes such as biodiversity loss, climate change, fresh water availability, ocean acidification. In climate change the carbon dioxide mixing ratio in the atmosphere currently at 400ppm has crossed a planetary threshold estimated at 350ppm beyond which irreversible changes are likely. Frequently these changes are portrayed as the lessons to humanity from physics and chemistry. The IPCC, too, tends to present global warming as a politics-free message from nature itself. This message is delivered to the UNFCCC delegates who congregate in annual Conferences of the Parties (COPs), for example COP21 held in Paris in 2015. The "non- political" message from the five yearly Assessment Reports of the IPCC is intended to sink in to the delegates' minds and result in a suitable global policy and political response.

What is the consequence of this apocalypse perspective?

As a consequence of the need to present global warming as a serious crisis, but not to differentiate between the differential impacts on a heterogeneous society, the crisis is given the perspective of an apocalypse. The impact may be differential but the severity requires a focus on the common rather than the differential. The apocalypse perspective results in keeping certain aspects of the crisis being kept hidden from view. One consequence is that the apocalypse is portrayed as apolitical and common to all. There is no need to adopt any social class analysis and people can be considered an undifferentiated subject. Existing social conflicts are flattened out and society can be considered monolithic and homogeneous in the face of this threat. The mainstream discourse on climate change then appears to addresses a middle-class perspective not directly affected by fossil-fuelled globalisation.

How is this apolitical perspective very political?

This apocalypse perspective is actually political in character as the process of exclusion of the 'many' and empowerment of the 'few' indicates. Privileged classes and a technocratic elite are empowered with active roles through the emphasis on expert knowledge and what Wolfgang Sachs has called the ecocracy (an ecologically aware bureaucracy) (Sachs1997).This disempowers the many which are made into passive victims of climate change and constructs the ecocracy in an active role of addressing climate change. This apocalypse perspective ties into the dualism of splitting the world into a separate Nature and a separate Society. The creation of an undifferentiated nature and undifferentiated social serves capitalist ideology. Experts are the saviours of the common good.

As a consequence of this dualism a nature has been constructed that is fatally unbalanced and externalised. This externalised nature is determining the fate of the social and the fate of humanity. Society is separated from nature and society is then homogenised around elite managers and their technological and organisational fixes. The future of diverse social communities is to be determined by 'Our common Future' on the lines of the Brundtland Report (Brundtland 1987).

How does the IPCC work?

Let us see how this works out in the case of the Intergovernmental Panel on Climate Change (IPCC). The IPCC is intended to provide 'science' to the policy makers. The policy makers gather together in annual Conferences of the Parties (COPs) functioning under the umbrella of the United Nations Framework Convention on Climate Change (UNFCCC). The statutory duty of the IPCC is to portray the science and not to engage in policy recommendations. The IPCC gives the message to the UNFCCC and it is expected that the message of science will sink in to the delegates of the COP. The lessons of science are the lessons of Chemistry and Physics and ultimately nature consists of these greenhouse gas molecules and the processes taking place in the Earth's atmosphere. Ultimately in the hands of the IPCC global warming

becomes a politics free message from Nature. At the core of this understanding of climate science are the Global Circulation Models or GCMs. Let us return to these GCM models.

What is the core of climate science? GCM models

The GCM models are supercomputer based models which have been built over a century of painstaking work involving data gathering techniques and creating meteorological networks. This history has been well described by Paul Edwards in his book where Edwards (2013) has taken pains to illustrate how climate models are not verified by raw data. In Cartesian reductionist science facts and theories are independent and experimental facts are expected to verify or reject theoretical models. This is the nature of science that we learn at school. However Edwards shows that in climate science and the GCM models in particular data and models are not independent. He characterised data as model filtered data and models as data laden models. In other words there is no such thing as raw data and data and models are interpenetrating entities. Models are not verified by raw data. So if data are model filtered and models are data laden how can models be verified by data? This interpenetration of data and models in GCM raises the question of the verification of GCMs. Ensembles of different GCM models are used to overcome this problem of verification but as these GCMs are few in number and share the same genealogy the sources of uncertainty and question of shared biases remain. The Integrated Assessment Models(IAMs) piggy back on the relatively more sophisticated GCMs and are unable to address the social issues with the same level of sophistication and remain quite mechanical in character.

What are the strengths of climate science?

Before examining the shared biases of climate science it is worth understanding the strengths of climate science. The focus of our comments will be the GCM models that are at the core of climate science and in particular climate policy. These models are based on well founded and well understood physical processes which operate at different spatial and temporal scales. Science accumulates knowledge in a slow painstaking process. This has been called normal science by Thomas Kuhn (1970) and Jerome Ravetz(1971), who have emphasised the changing nature of scientific paradigms. Reductionism which attempts to grasp entities from the nature of the parts that make up a particular entity involves certain kinds of simplifications. These simplifications enable the accumulation of progress in science and have enabled much scientific progress by avoiding the more complicated. Science has sometimes been characterised as the art of the soluble or even the science of the possible. These simplifications have both enabled progress and limited the progress of science to the more mechanical models of physics and left unaddressed the more complex examples of biology and complex systems. Normal science does not engage easily with a paradigm shift. The shared biases of normal science are more hidden in character and are often only revealed in the development and establishment of the new (post-normal) science taking its place.

What are the weaknesses of this science?

This brings us to the weaknesses of mainstream climate science. These weaknesses are related to the dualism of contemporary science and in particular the separation of the social from the natural in examining climate change. The natural is seen as a negation of the human and can be termed a nonhuman nature. Climate modelling focuses on this nonhuman nature. The nonhuman nature consists of entities like carbon dioxide molecules, cloud albedo and methane clathrates. Greenhouse gases, for example, that are portrayed in climate models are stripped of their history and politics. They are isolated from the human world as nonhuman nature. What is ignored are the complex socio-natural processes that create these greenhouse gases. Just as nature is nonhuman nature, similarly the social is a non-natural society. This non-natural society is excluded, ignored and unaddressed in climate models. Many social processes make up non-natural society and these are processes of surplus extraction, labour unions, commodities, energy policies, capital accumulation and the like. These social processes are outside the purview of climate science. When these social processes are ignored, excluded and unaddressed then what constitutes anthropogenic climate change? In other words how is the social brought back into the picture to create anthropogenic climate change?

Anthropogenic climate change?

Anthropogenic climate change as it appears in climate models oscillate between two extreme perspectives. One can be described as molecular fetishism and the other as a god's eye view. Anthropogenic climate change attempts to attribute causation and responsibility to social forces. This responsibility is assigned at the molecular CO_2 level i.e. these greenhouse gas molecules are assigned responsibility for the greenhouse effect which is the driver of climate change. Attributing social power to inanimate objects like greenhouse gases is an example of commodity fetishism. In this perspective the history and politics of carbon emissions is not part of the picture. Alternatively climate policy imagines an overseer of the climate machine. This is a consequence of framing climate change as nonhuman nature and creates what has been called the god's eye view. Scientists as creators and interpreters of the model climate machine become the privileged observers of climate change. Policy makers on the basis of the 'facts' provided by expert scientists decide the social aspects of climate change.

What is ignored in climate science?

As society is pictured as monolithic in character in these models they tend to exclude those aspects related to climate injustice. The distinction between subsistence CO_2 emissions and luxury CO_2 emissions as pointed out by Sunita Narain and Anil Agarawal(1991) is ignored in climate models. The distinction between sites of production of carbon and sites of consumption of carbon are also ignored. Climate models make nation states the unit for identification and measurement of carbon

emissions. The politics of oil companies, the history and politics of fossil fuel burning machines are made irrelevant in climate models. In agriculture the distinctions between industrial agriculture and agroecology with regards to energy intensity are similarly irrelevant. Industrial agriculture has been built on cheap fossil fuels and the Energy Returned on Energy Invested (EROI) from the industrial food chain in agriculture is much smaller than that from the peasant food web. These are examples of the kind of processes that are excluded or ignored in climate models.

What is the evident bias of GCMs?

The bias of the GCM models is that capitalism which is historically responsible for excessive dumping of fossil fuel products into the atmosphere is now considered irrelevant. The process of capital accumulation and the way in which barriers to this process are addressed and overcome characterises modern politics and the economic crises and environmental crises surrounding us. The biases of GCM are not located in the quirks of individual models but rather are shared biases in the whole community of models. Humans and other species are removed from the climate picture. The environment is transformed into resources for capital accumulation. In a historical process of enclosure workers are separated from their environment. The workers are now transformed into cyborg workers through being embedded in fossil fuel based production. This process has created and isolated non-natural humans (cyborgs) who can make commodities out of natural resources (non-human natures). In this way nature has become the environment and the environment has been transformed into resources. (For a more detailed description see Energy, Work and Finance by Nicholas Hildyard and Larry Lohman, The Corner House (2014)). Social processes such as the process of enclosure where workers are historically separated from their environment are absent from climate models. The bias of GCM models is then based on the separation of society from nature and the subsequent attempts to reintegrate the social in the form of anthropogenic climate change.

Capitalism creates non-natural humans and non-human nature and these processes are based on a separation of nature from the social. Non natural humans are a consequence of a process of enclosure which entails the separation of human beings from their land and forests and enable capital to make a profit out of the work of non-natural humans i.e. those separated from their means of livelihood. The creation of a non human nature enables the transformation of the environment into resources required for extended commodity production.

Once separated from humans, nature becomes resources and these resources are threatened by popular encroachments (e.g. processes like reclaiming the commons). As a result a coercive sustainable development paradigm emerges where resources have to be managed by experts in a sustainable manner and this results in the contradictions of development which increasingly threatens peoples' traditional livelihoods.

Similarly, nature is manufactured by dismantling myriad relations between human and non-human species. These entanglements and the embedded character of the social in the natural have been transformed by capitalist development. As a consequence the environment is characterised as moving from the Holocene to the Anthropocene – the rate of erosion of biodiversity is also characterised as the possible sixth global mass extinction.

What have been the consequences of this separation of human beings and nature?

This separation of human beings from nature has transformed both mankind and nature. The change in human nature is particularly marked in the rural urban divide where the shift from rural to urban living has transformed human nature. In this same process nature has changed. From a socio-natural perspective underlying the production of nature perspective we see these processes as processes of co-evolution. Labour has been transformed into abstract labour, Nature has become a more abstract nature. The process of enclosure is a social process where the people and processes have been taken out of one frame and have been inserted into a different frame. This is a process of disentanglement and re-entanglement in a different frame which reflects shifts in the balance of power within society.

How does this process of abstraction proceed in both making abstract nature and abstract labour. The abstraction of labour under capitalism has been described by Marx in much detail. How does this process of abstraction take place in nature? Under trading in ecosystem services, nature is not made up just of species but also of "species-equivalents". Capitalism adopts a perspective of universal substitution where resource depletion is addressed by resource substitution. The atmosphere, too, is made up not just of molecules but also of "molecule-equivalents". In the greenhouse effect we talk not about carbon dioxide and other greenhouse gases but about carbon dioxide equivalent (CO_2e) and the Global Warming Potential (GWP) of different greenhouse gases which enable the effects of different greenhouse gases to be measured and compared. Work no longer engages with vernacular little-e energies but homogenised abstract Big-E energy. This social transformation described in the transition from using vernacular little energies-e to the human need for abstract Big-E Energy has been discussed in more detail by Hildyard & Lohmann (2014). Nature no longer consists of particular places and things but more abstract space and natural resources. Similarly the abstraction of clock time helps create an abstract Time to accompany the development of abstract Energy. The process of abstraction engages with the making of more and more equivalents. The emerging field of Payment for Ecosystem Services (PES) is a more recent version of this process of creating equivalents in practice and the making of an abstract Nature. As a consequence nature is being transformed into a nature devoid of both human and other living species.

What concepts and tools are needed to tackle environmental issues?

Rosa Luxembourg: "the seeds of the future .... can be found in the capitalist present"

Audre Lorde: "For the master's tools will never dismantle the master's house. They may allow us to temporarily beat him at his own game, but they will never enable us to bring about genuine change."

This paper has explored the limits of climate policy from Kyoto (1997) to Paris (2015). The mandatory emission reductions of Kyoto have been replaced by voluntary targets of the Intended Nationally Determined Contributions (INDC) in Paris. The Emission Trading Systems (ETS) of the European Union have been bogged down in perverse incentives and other controversies. What is the way forward?

The production of nature perspective relates how the distribution of social surplus has evolved historically and how this social evolution has been accompanied by changes in nature which can best be described and understood as a process of co-evolution of nature and society. The social and the natural interpenetrate and evolve not independently but as part of a single process, a metabolic process involving a natural metabolism, (the biogeochemical cycles of nature) and a social metabolism related to the appropriation and distribution of the social surplus.

This paper has examined some of the limitations of climate governance derived from climate science and the Global Circulation Models (GCM) at the core of climate science. The tools required for addressing climate must be found in incipient form in the capitalist present as depicted by the Rosa Luxembourg quotation. But at the same time as expressed by Audre Lorde "these master's tools" will never dismantle the master's house. These two quotations appear contradictory but they both express a living reality. Our comments on the concepts and tools required for tackling climate change should be seen in a similar light. The limits of climate change mitigation and adaptation efforts have been criticised but what are the alternatives.? Naomi Klein in her recent book entitled "This changes everything. Capitalism vs. The climate" addresses the same issue. How to build social movements and alliances to address the issues of climate injustice and thereby begin to address the linkages between Capitalism and Climate Change? These linkages have been obfuscated by the mainstream approach to climate change. Traditions of sharing, commoning, the commons and collective forms of property are found in numerous interstices of capitalism. The struggles to resist enclosures are widespread as new commons are also being created. The top down approach to climate change as personified in the god's eye view of a hypothetical overseer has to be challenged by a bottom up approach based on movements challenging the injustices of climate change and capitalism. The social needs to be reintegrated with the natural.

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