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그린스쿨 주요 활동 및 일정



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2013년 그린스쿨 교수진 활동

- 제 5차 International Symposium on Innovation Solar Cells
 - 1월 21일부터 22일 양일간 일본 쓰쿠바에서 개최된 본 회의는 초고효율 태양전지 제작을 목적으로 한 화합물, 박막 태양전지 분야의 학술 심포지움
 - 김동환(고려대) 교수, 태양전지 모듈의 열화 메커니즘에 대한 주제로 초청 발표
- 제 1차 International Conference on Desalination Using Membrane Technology, DMT
 - 4월 7일부터 10일까지 스페인에서 개최된 제 1회 DMT 회의에서 홍승관(고려대) 교수, "Fouling evaluation and pre-treatments for RO-based desalination process"를 주제로 기조연설
- 제 3회 국제 수자원수처리 산업전 & 컨퍼런스 (International Water Industry & Conference, WATEREX)
 - 4월 29일부터 5월 1일까지 서울 코엑스에서 개최된 제 3회 WATEREX 회의에서 홍승관(고려대) 교수는 조직위원회 위원장으로 활동
 - 또한 "Recent development of hollow fiber FO membrane for osmotic dilution process", "Introduction of Advanced Water Treatment Quality Management", "Future Direction of Technology Development of Shale Gas Water Treatment" 등을 주제로 발표
- 제 46차 IEA Advanced Fuel Cell Implement Agreement(AFCIA) 실행위원회
 - 5월 22일부터 23일까지 개최된 제 46차 IEA AFCIA 실행위원회에 임태훈(KIST 국가기반기술연구본부) 본부장, 산자부 임명 한국대표로 참석하여 Annex 23의 활동을 비롯한 한국의 연료전지 R&D 현황, 보급 및 정책을 보고하였으며, 실행위원장 선거에 참가함
- 제 18회 환경의 날 기념식
 - 6월 5일 대구에서 개최된 제 18회 환경의 날 기념식에서 윤성택(고려대) 교수, 환경보전에 기여한 공로를 인정받아 대통령 표창 수여
- 제 1회 나노와이어 차세대 태양전지 국제심포지움 (The 1st International Symposium on Nano-Wire Si Solar Cells)
 - 6월 10일 일본 도쿄 Institute of Technology에서 개최된 차세대 태양전지에 대한 첫번째 국제 심포지움으로서 일본의 Future-PV innovation의 일환으로 진행됨
 - 김동환(고려대) 교수, "Si nano-wire solar cells"에 대한 주제로 강연

■ 제 36차 세계에너지경제학회 (International Association for Energy Economics, IAEE) 연차총회

- 세계에너지경제학회는 미국에 본부를 두고 전 세계 70개국에서 5,000명 회원이 등록된 학회로서 에너지경제분야의 학계, 산업계, 공공부문에 종사하는 전문가들의 지식교류가 목적
- 6월 16일부터 20일까지 대구에서 개최된 제 36차 연차총회는 8개의 총괄회의와 21개의 분과회로 구성되었으며, 40개국 300여명 참여 하에 총 270편의 논문발표가 이루어짐
- 이회성(고려대) 교수, 대회장(General Conference Chair)으로 회의를 주재

■ 제 12차 International Conference on Biogeochemistry of Trace Elements, ICOBTE

- ICOBTE는 토양지하수환경계 미량 무기오염물질의 생지화학적 반응 및 거동에 대한 연구결과를 발표하는 국제학회
- 미국 University of Georgia에서 6월 16일부터 20일까지 개최된 제 12차 회의에서 이승학(KIST) 교수, "Effect of seepage velocity on attachment efficiency of TiO₂ nanoparticles in porous media"를 제목으로 연구결과 발표

■ 제 87차 ACS Colloid & Surface Science Symposium

- 6월 23일부터 26일까지 미국 University of California에서 개최된 제 87차 심포지움에서 이승학(KIST) 교수, "Attachment Efficiency of TiO₂ Nanoparticles in Sands under Low Seepage Velocity"를 제목으로 연구결과 발표

■ 국회 에너지특별위원회 활동

- 국회 차원에서 6월 28일 발족된 '에너지특별위원회'는 에너지 관련 주요 이슈에 대한 총체적 점검과 평가를 통해 종합 대책 마련이 목표
- 에너지특위는 전력수급, 원자력 안전, 에너지 믹스에 대한 종합점검, 에너지 기본계획에 대한 정책토론회 개최 활동 등을 전개할 예정
- 방기열(고려대) 석좌교수, 에너지특위 위원으로 활동

■ 제 14회 한일촉매학회 (Korea-Japan Symposium, on Catalysis)

- 한일촉매학회는 2년마다 개최되며, 한일 양국 촉매 연구자들 간의 최신 연구결과 및 연구동향을 공유하고 양국 협력관계를 증진하는 것이 목적
- 이관영(고려대) 교수, 7월 1일부터 4일까지 일본 나고야에서 개최된 제 14회 학회에서 조직위원으로 활동

■ 몽골과학기술대학 하계 필드캠프

- 7월 2일부터 7일까지 윤성택(고려대) 교수는 몽골과학기술대학(Mongolian University of Science and Technology)의 School of Geology and Petroleum Engineering의 초청으로 Department of Hydrogeology and Environmental Geology 소속 학부생의 하계 field camp에 참가하여 강의 및 현장교육을 수행
- 위 학과에서는 매년 여름방학 중 야외캠프에서 생활하면서 현장조사에 대한 집중교육을 실시 중이며, 윤성택 교수는 김호림, 정희원(그린스쿨) 학생들과 함께 참여하여 대학원의 "지하수 수질 현장조사 및 자료 해석"을 주제로 특강과 현장조사를 실시

VI. 그린스쿨 주요 활동 및 일정

■ 한국미생물·생명공학회 국제학술대회 (KMB's 40th Anniversary 2013 International Symposium & Annual Meeting)

- 7월 3일부터 5일까지 강원도 평창에서 개최된 본 회의에서 김종배(고려대) 교수, “Nanobiocatalysis for Biosensors and Biofuel Cells”와 “Nano-enzyme Systems and Their Potential Applications”를 주제로 강연을 진행

■ 2013년 CMOS 신흥기술연구 심포지움 (2013 CMOS Emerging Technologies Research Symposium)

- 7월 17일에서 19일까지 캐나다 휘슬러에서 개최된 본 회의는 전 세계 IT기반 전문가들을 대상으로 전기전자 분야의 기초연구 및 태양광에너지, 센서 응용 분야의 최신 연구결과를 공유하고 논의하는 국제학술대회
- 김종배(고려대) 교수, “Nanobiocatalysis and Its Potential Applications in Biosensors and Biofuel Cells”를 주제로 강연을 진행

■ 제 9차 세계화학공학학술대회 (World Congress of Chemical Engineering, WCCE)

- 세계화학공학학술대회는 4년마다 개최되는 세계 화학공학자들이 참여하는 최대 학술대회
- 제 9차 대회는 서울 코엑스에서 8월 18일부터 23일까지 개최될 예정이며, 참가자의 수와 학술적 파급효과 면에서 종전 대회보다 큰 규모가 될 것으로 예상
- 이관영(고려대) 교수, 본 학술대회의 부위원장으로 활동

그린스쿨 학생 활동보고서

주민의 생계와 생태계가 처한 위험: 2013 ISP 연구팀의 관찰과 조사 결과

2013년 1월 11일부터 24일간, 그린스쿨 대학원 신재생에너지 전공의 석사과정 김정운, 첨단환경공학 석사과정 김호림 그리고 에너지·환경정책 전공의 박사과정 이은주는 미국 텔라웨어 대학교의 Center for Energy and Environmental Policy (CEEP)가 준비·조직한 '2013 인도 연구 프로그램(India Study Program, ISP)'에 참가하였다. ISP는 에너지 사용과 개발에 관련된 시민사회의 환경영향에 대한 이해를 높이는 것을 목표로 한 프로그램이다. CEEP의 소장이자 특훈 교수이신 John Byrne 교수님의 지도아래, CEEP 박사과정 겸 교수인 Sanjay Gopal 박사 및 6명의 CEEP 연구원들과 3명의 그린스쿨 대학원 학생들이 참여하였다. CEEP가 발간한 연구보고서 『Livelihoods and Ecosystems at Risk: the Observations and Findings of the 2013 India Study Program (주민의 생계와 생태계가 처한 위험: 2013 ISP 연구팀의 관찰과 조사 결과)』은 댐 건설에 따른 수몰지역에 의해 발생한 피해, 사회적 분열 및 갈등에 대한 관찰과 조사를 바탕으로 작성된 것이다. ISP팀은 1월 16일부터 1월 19일까지 나마다 계곡 개발 프로젝트(Narmada Valley Development Project, NVDP)의 영향을 받고 있는 지역사회를 방문하였다.



사진 1. Medha Patkar와 지역주민들이 수몰지역의 피해에 대해 설명 중이다.

Ⅶ. 그린스쿨 주요 활동 및 일정

나마다 강은 마다 프라데쉬(Madhya Pradesh), 구자라트(Gujarat) 그리고 마하라스트라(Maharashtra) 등 3개의 주를 거쳐 흐른다. NVDP는 30개의 대형, 135개의 중형, 3000개의 소형 댐 건설을 계획하고 있는 만큼 중국의 삼협댐(산사댐) 프로젝트 보다 훨씬 큰 규모이다. 인도의 중앙정부는 개발을 위한 수자원 관리 및 수력을 통한 전기 공급을 댐 건설의 주요 명목으로 내세우고 있다. 그러나 이러한 대규모 댐 건설은 사회로부터 고립되고 소외된 수많은 부족민들과 달리트(인도 카스트 제도에서 최하 계급)로 구성된 지역주민의 삶의 터전과 일터를 빼앗아 가는 등의 문제로 인도의 가장 중요한 사회 이슈로 부각된 지 오래다. 인도의 여러 이익 단체들은 이 프로젝트에 관련한 비용편익 분석을 실시하였고, 그 결과에 따라 정부에 맞서 댐 건설에 반대하고 있다. 이들의 노력으로 공사가 시작된 지 30년이 되어가도록 완공률은 25%로 미미하지만, 인도 정부는 공사를 중단할 계획이 없다고 한다.

NVDP는 땅의 수몰로 인한 이주민 문제뿐만 아니라, 물 순환 및 해양 생태계의 혼란과 농어업민의 생계수단 상실을 초래하여 왔다. 이미 일부 진행된 공사로 많은 피해가 일어났고, 이후 공사가 계속해서 진행된다면 주민들의 생계 및 자연 생태계의 예상 피해는 지속가능발전을 기대하는 현 국제사회의 노력에 반하는 결과를 초래할 것이다. 자연 순리를 거스르는 NVDP는 인도 정부가 예측하는 만큼의 물 공급이나 에너지 공급을 제공할 수 없을 것이다. 이에, 관련자들과 지역주민들은 그들이 처한 문제가 더 많은 곳에 알려지기를 원하고 지지를 호소하고 있다.



사진 2. Chhota Barda 마을 주민들과의 함께

그린스쿨 대학원생들은 이와 같은 특별한 체험을 가능하게 해주신 CEEP, Dr. Byrne, Ms. Patkar, 그리고 Dr. Gopal께 감사의 말씀을 전하고 싶다. 또한, 어렵고 힘든 환경 속에서도 우리를 환대하여 주신 나마다 계곡의 가족분들과 어린이들에게도 감사 드린다.

REPORT¹

LIVELIHOODS AND THE ECOSYSTEMS AT RISK: OBSERVATIONS AND FINDINGS OF THE 2013 STUDY TEAM

1. Trip Purpose and Participants

The Center for Energy and Environmental Policy (CEEP), at the University of Delaware, organizes annual study visits to strengthen the understanding and experiences of its researchers in matters of global significance to the field. CEEP has conducted five study visits to India, including its 2013 India Study Program (ISP) (January 11 to 24). For its 2013 Program, it partnered with Korea University's Green School with the aim of learning about the development process and its impact on livelihoods, natural resources, energy, and ecological sustainability.

The ISP 2013 was led by Dr. John Byrne, Distinguished Professor of Energy and Climate Policy and Director of CEEP, and included seven post-graduate researchers from CEEP and three from the Green School of Korea University.

1. Dr. John Byrne, Distinguished Professor of Energy and Climate Policy & Director CEEP
2. Brittanie Booker (USA), MS student, Energy and Environment Policy, CEEP
3. Sanjay Gopal (India), PhD candidate, Energy and Environment Policy, CEEP
4. Ho-Lim Kim (South Korea), MS student, Advanced Environmental Science, Green School, Korea University
5. Jung-Yoon Kim (South Korea), MS student, Renewable Energy Engineering, Green School, Korea University
6. Eun Ju Lee (South Korea), PhD student, Energy and Environment Policy, Green School, Korea University
7. Leon Mach (USA), PhD candidate, Energy and Environment Policy, CEEP
8. Andrea Ruotolo (Argentina), PhD student, Energy and Environment Policy, CEEP
9. Kathleen Saul (USA), PhD student, Energy and Environment Policy, CEEP
10. Kelsea Schumacher (USA), PhD student, Energy and Environment Policy, CEEP
11. Yeng-Chieh (Jay) Tsai (Taiwan), PhD student, Energy and Environment Policy, CEEP

¹This report is decided to republish in Green Monitor under CEEP's permission. Green School wants to extend sincere gratitude for CEEP's profound contribution in organizing and preparing the study visit and report.

VI. 그린스쿨 주요 활동 및 일정

Logistics planning and support for the 2013 ISP was provided by Meenal Utturkar, who accompanied the study team.

The team visited the Narmada Valley during January 16–19, 2013 and conducted community meetings with tribals, farmers, women, youth, and market committee members in the Valley, covering the three concerned states of Maharashtra, Madhya Pradesh and Gujarat.

Prior to its visit and after completion of 11 community meetings, the members of the Study Team consulted online and hard-copy documents related to dam and canal projects in the Valley.

2. Background

The Narmada Valley hosts the largest of India's water diversion projects. Begun in 1946 the project includes dams of all sizes, canals, reservoirs and other engineered impoundments and distribution systems. Plans for and actual construction of the diversions has nearly always attracted protests and the states through which the Narmada River courses – Madhya Pradesh, Gujarat and Maharashtra – have often contested project proposals. The Government of India responded in 1969 by creating a central authority, the Narmada Water Dispute Tribunal, in order to address ongoing conflicts.

The history of protests and challenges is not surprising. The Valley is projected to host 30 major dams (height \geq 30 meters; storage capacity \geq 6250 hectare meters), 135 medium (height \geq 12 meters and $<$ 30 meters; storage capacity between 125 and 6,250 hectare meters) and 3,000 minor dams (height $<$ 12 meters and \geq 8 meters; storage capacity between 125 and 6 hectare meters)² on the Narmada and its 41 tributaries. The largest dam, Sardar Sarovar, has drawn the most attention and controversy. Because it is an interstate river, 1,300 kilometers long with a 1,00,000 square km wide basin, the conflict is often expressed at the state level (especially the states of Maharashtra, Madhya Pradesh and Gujarat).

Under the 1956 Interstate Water Dispute Tribunal Act, conflicts are to be addressed through a central government-created tribunal. In the case of the Narmada Valley, the Tribunal issued a decision in 1979 which stipulated specific provisions for rehabilitation, including land-for-land to the landed families and the major sons of the land owners; the rehabilitation of project affected villages with house plots and civic amenities; and mandatory cost and benefit sharing among the three states.

The World Bank initially was a party to the project, with a loan package of \$450 million offered in 1984. During its participation, benefits to the project affected families (PAF) including land rights, and indigenous people were given additional rights to cultivate forest land in Maharashtra and Gujarat. However, amidst

² Classification by Central Water Commission (1987), Ministry of Water Resources (Government of India)

protests and after a comprehensive international review of the project showed serious non-compliance and planning as well as execution problems, the World Bank withdrew in 1994, leaving the central government and 4 state governments (including Rajasthan) to finance and develop the multi-purpose project.

State level policies improved benefits for the PAF community in the wake of intensified social movement demands which questioned the costs versus benefits of the project. To exemplify, alternative livelihoods to the landless were granted in Madhya Pradesh policy.

A key actor after the World Bank ended its participation has been India's Supreme Court, which has issued rulings on rehabilitation policy with interpretations in favor of the internally displaced people such as the guarantee of land to major sons of farmers. The tribunal distributed irrigation benefits to Gujarat (91%) and Rajasthan (9%) and 56%, 27% and 17% power benefits to Madhya Pradesh, Maharashtra and Gujarat, respectively. Despite the fact that 90% of the river water is found in Madhya Pradesh, none of the impounded water of Sardar Sarovar Dam up to 214 kilometers is allocated to this state.

India's Ministry of Environment and Forests has also played a vital role in project planning by specifying important pre-conditions including measures for environmental losses due to projects such as compensatory afforestation, command area treatment, command area development, fisheries development, etc.

Although serious pre-conditions have been specified by the Supreme Court, state Ministries, and the Tribunal, many do not appear to have been followed. Admittedly, above 10,000 indigenous families are granted land for cultivation and habitation in this project. However In each of the 11 community meetings conducted by the Study Team, a host of irregularities and apparent violations were reported. The rights of affected people, protections for the environmental and natural resources, and adherence to laws were reported to have been violated involving thousands of families of indigenous people, farmers, fishermen, traders, artisans, and laborers. The Study Team is extremely worried about the fate of all these families not yet rehabilitated, and still living in the affected area mostly below the present dam height (i.e. 122 meters). These families number between 40,000 and 50,000 and hence it is a formidable proposal put forth by the project planners to lift the Sardar Sarovar Dam height from 122 meters (the present height) to 139 meters, which will flood not only these farms and the other common properties such as shops and markets, schools and dispensaries, community centres, temples and mosques and other cultural amenities, but also a large number of houses of all those who have yet to shift from their original village.

The study team has especially noted with great concern that there are more than a million trees standing in the dam affected areas, most of which are in the affected area at the present height of the dam and the rest, in the affected area of the proposed final height. It is also to be noted that there is a large area of primary forest and hundreds of years old trees in the Nimad area of Madhya Pradesh. This biomass, if decayed, will lead to emission of greenhouse gases. With important worldwide deliberations underway about climate

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change, this project impact should be seen as an unacceptable environmental risk, when alternatives readily exist.

The cost of the project now exceeds its original estimate by a factor of ten with the latest projection anticipating a total cost of above 40,000 crore Indian Rupees. Surprisingly, we were unable to locate a detailed review of the major escalation in cost which by now should have been brought into the public domain.

3. Observations

3.1. Energy and Water

Two key rationales for the extensive hydraulic engineering in the Valley are:

- Improved water access, affordability, and reliable supply, especially for irrigation
- Low-cost, reliable supply of electricity, including to farmers.

Government reports commonly cite these rationales and often rely on logical principles to justify them. Thus, water supply in an area reliant on monsoonal flow for much of its volume would seem to logically require diversion in order to distribute available water to those months without rain. Similarly, the cost of hydroelectric power is commonly observed to be lower than other forms of generation and in areas where interruptions in service are needed, added electrical capacity should be a welcome stimulus to the regional economy and an improvement in daily life.

However, an inspection of documents and conversations with farmers, fishermen and marketing committee officials in the Valley reveal empirical conditions contrary to the assumed benefits of the projects.

Farmers and fishermen in the 11 community meetings conducted by the Study Team reported decreased water access and less reliable supply. Many factors led to these actual conditions, but key ones include:

- Family relocations to barren or low fertility lands which require more water and more expense to maintain livelihoods
 - Family relocations to lands without water distribution systems that would support them (often because projects in the Valley prioritize infrastructure needs of large water users)
 - Saline penetration into freshwaters, leading to fouled fishing areas and significant fish kills
 - Displaced families who have yet to receive alternative land (in some cases, families reported being without promised land for more than a decade).
-

In all of these cases, water access, affordability and reliable supply have suffered. The 11 community meetings conducted by the Study Team cannot be regarded as a random sample but all visited communities had been project-affected for years – more than enough time to provide legally required alternative land commensurate with livelihood needs. According to village leaders and marketing committee members in the three states we visited, the problems reported by farmers and fishermen are typical and ongoing, suggesting that a serious deficiency exists – projects designed to address water needs of agriculture and fish culture have in fact frequently resulted in less water, higher expenses to maintain livelihoods, and significant supply uncertainties for families.

Reports published on actual water distribution in the Valley raise important concerns. For example, a report published by the Tata Institute of Social Sciences (TISS) in 2008 notes that in Maharashtra, water withdrawals are sinking many villages and leading to displacement of many adivasi communities in apparent violation of Indian law. Additionally, much of the water intended for agriculture is instead serving industrial applications and thermal power production. For example in 2006, the Sardar Sarovar Project (SSP), the largest infrastructural project in the Valley, was found to provide 61.91 million liters of water per day (MLD) for industrial uses (TISS, 2008). This exceeded the 45 MLD allocations to industry and reduced the domestic use allocation to 0.06 million acre feet (MAF) from the required 0.86 MAF allocation. The water endowed to agriculturalists in Maharashtra is essentially being siphoned off in a process that is contributing to pollution and severe water shortages where there was once clean abundant freshwater.

Water scarcity in this monsoonal area may also be exacerbated by other project inputs. For example, canal construction and associated excavation debris can create barriers to the natural hydrological cycle in the region. These structures may be preventing aquifer replenishment, as less water will be able to percolate through the soil. Diverting water could therefore lead to shortages in drinking and agricultural water in areas that have typically had reliable access.

As well, the water diverted to thermal power plants can be fouled during the electricity generation process and returned to the waterways untreated. This would affect the quality of the water available to downstream users and may eventually require expensive water treatment facilities.

The second rationale for extensive hydraulic engineering in the Valley is energy supply. Here again, the Study Team learned that performance is in conflict with what is promised in project documents. In terms of electricity, for example, the dam has consistently produced less power than forecasted by project authors.

Documents accessed by the Study Team indicate that the Tribunal gave priority to water supply over electricity generation and this may explain the observed under-performance. But if so, this raises a question about the advisability of the interstate benefit structure, especially from the perspective of Madhya Pradesh's farm and fishing communities and Maharashtra's business sector. Over 90% of the water distributed under

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the Tribunal's decision is taken from Madhya Pradesh and provided to Gujarat, while this state and Maharashtra can claim 50% of electricity generation. With supplied electricity well below forecast, Madhya Pradesh's farmers and fisher folk appear to be paying a heavy price, as are farmers and businesses in Maharashtra, the location of the largest dams, and its associated displacement impacts. If the pattern of electricity under-performance continues, neither state will realize promised energy benefits while bearing significant water losses and displacement impacts.

An additional concern is the diversion of capital investment from readily available local energy resource development that would have been consistent with reliable water supply. The Valley has ample renewable energy resources which could be harvested on scales that meet local needs without large dams and the problems of water access, affordability and reliability of supply they pose. Costs of renewable energy generation have declined considerably in the last decade and may be competitive with retail electricity prices in the Valley. Also important, these options offer a measure of local control that could offset the undesirable interruptions that are routinely experienced by rural families in Madhya Pradesh and Maharashtra (as reported by participants in community meetings throughout the two states).

In sum, the water and energy rationales for extensive hydraulic engineering of the Narmada Valley are questionable at this stage of the project's development. Rather than more water and energy, less of both appear to be the experience of many villages; rather than reliable water and electricity supply, high levels of uncertainty appear to be pervasive; and rather than improved access, fisherman and farmers report diminished energy and water availability at affordable cost. Before further build-out occurs, it would be prudent for these experiences to be examined in greater detail as part of a systematic study of village impacts and concerns.

3.2. Participation and Violation

The Sardar Sarovar Project received clearances from the Ministry of Environment and Forests in 1987 and from the Planning Commission in 1988 provided certain pre-conditions were satisfied. Following are some of the aspects of the project that were covered in the pre-conditions:

- a detailed rehabilitation master plan
- a phased catchment area treatment scheme
- compensatory afforestation plan
- a plan for command area development
- a detailed survey of flora and fauna
- a thorough study of the carrying capacity of surrounding area
- details of seismicity for the area

- a study of the health aspects associated with the construction of the dam

For rehabilitation as well as the environmental pre-conditions of the project to be satisfied, civil society participation was strongly recommended. Accordingly, the administrative machinery of the project sought the participation of local civil society actors in the planning process for the resettlement and/or compensation of people affected by the projects. The community meetings conducted by the Study Team, however, revealed the harsh reality. Firstly, the clause of participation itself was violated throughout the Valley. Secondly, in areas where systematic consultation was sought by the PAFs, changes were made in the nature of rehabilitation or compensation. Tasks were left incomplete, with no land available, no adequate finance and concerns of the local populace remained unaddressed. It was revealed through the intense narrations provided at the community meetings that for the PAFs in the Valley, the power to participate in the process did not bring the power to influence the decision-making.

State officials and those overseeing the projects continue to violate the rights of the local people by failing to consult them as regards the plans for the projects, by failing to take the time and make the effort to talk to the local people in their towns and villages, and thus failing to take the people's real needs into consideration.

Gross violations regarding the following issues were highlighted in the community meetings as those of primary concern:

- It is legally binding on officials to adhere to pre-approved rehabilitation norms for project oustees that require land to be given to these PAFs to replace the lands they had lost due to the projects. However, the local community revealed to the Study Team that many families affected by the 1993-94 submergences are still awaiting the allotment of their share of cultivable and irrigable land. Land offered to the PAFs for farming, we are informed, is mostly barren, uncultivable and irrigation is not provided. The affected families obviously and rightfully, have rat, Madhya Pradesh has not and does not intend to purchase or acquire private lands for rehabilitation. Large tracts of land, on the other hand, are being diverted to companies in the same state.
- With respect to the Special Rehabilitation Package that provides monetary compensation for lands lost, over 1,450 families have received only one installment of the package and, hence, have been unable to purchase land to for their homes and farms.
- Those who were rehabilitated were promised alternative house plots with civic amenities in 'rehabilitation villages'. Plots are allotted. In some cases the agricultural land offered is 100 to 200 kms away from the plots offered or allotted, and hence were rejected. Many house plots changed after they were reported to have been allocated, and illegally transferred to influential persons from within or outside the affected village, always for a 'price'.

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- To be uprooted from one's village and ancestral home is also to have one's livelihood uprooted. The farmers, fishermen, potters, and others from rehabilitated villages who have depended upon traditional knowledge and the cultural and ecological contexts for their livelihoods, have yet to find alternative livelihoods, although the same has been guaranteed under the Policies and Action Plans.
- The preferential allocation of benefits to industries and the ensuing constant conflict because of the mismanagement of resources and lack of proper planning has led to delays and stays in the construction of the canal networks. As of today, not more than 30–35% of the canal work has been built. Thus, those farmers, especially at the tail end of the river, who were promised irrigation for their existing lands, have not received the benefits of the dam.

3.3. Reimbursement of the PAF – Cash for land vs. land for land

In an increasingly urbanizing world, money can be exchanged for almost anything as 'price' gradually replaces the 'value' of life, resources and even sentiments. With the obvious shortage of fertile land easily available to provide as compensation, the state has tried to implement a plan substituting cash for the promises of land. The following issues are of main concern to the Study Team and were expressed by community members throughout the trip:

- The state offers an equivalent of two years income from farming as the cash substitute for land. It might seem like a large sum of money, compared to typical earnings of PAFs, but it is not enough to compensate for the expenses incurred in re-establishing a farming enterprise, according to families meeting with the Study Team.
- For these communities, land is much more than a mere resource. For generations together, they have lived on and cultivated this land. The Valley holds a traditional, historical and cultural value for people. Culture and identity are tied together with the land. Submerging these areas including places of worship, shrines and monuments, weakens an entire culture. It is impossible to place a price on the value of what will be lost for people. Making cash payments as compensation for the loss of a culture would be reductionist and would imply a failure to recognize the multi-dimensionality of the issues related to resettlement and rehabilitation of people.
- The Narmada Valley currently supplies the bulk of the sugar cane, fruits, and vegetables for surrounding states. If land is not provided to PAFs, disenfranchised people will not find suitable land to farm. And even when oustees find lands to farm, it takes considerable time before family farms can be organized

to yield earlier volumes. In some cases, recovery has proven to be impossible. The delay in production will cause an exacerbation of the already growing problem of food insecurity.

People receiving cash payment may choose to not use it to purchase land, but instead may use the money to migrate to other cities and towns. In this case, agriculture will suffer, and the influx of immigrants from the Valley into urban centers may stress the already strained resources of those settlements.

4. FINDINGS

On the basis of its investigation and interaction with people as well as the study of selected important documents and reports, the Study Team has reached the following findings:

- The large scale of displacement along with impact on the forest, fertile agricultural land, fishing and habitat outweighs the benefits of Sardar Sarovar, one of the two largest dams in the Narmada Valley. The story may prove to be the same in the other 29 large dams which are under construction in the Valley.
- A complete review is needed to assess the feasibility of measures to mitigate loss and protect the ecosystem and generations of original inhabitants. Until this review is completed to the satisfaction of the PAF community, no further construction should take place.
- Narmada Valley is home to one of the oldest civilizations on earth. Its culture should be considered for preservation as a World Heritage Site.
- An extensive water and energy audit is needed to find practical alternatives which can enable recovery from the decades-long harm attributable to the project.
- Paying cash in place of land and other benefits in rehabilitation should cease. The evidence from this project is that it has failed to meet the needs of the PAF community.
- Canal network should not be permitted in the already irrigated region because it would cause unjustifiable destruction of prime land, the ecology and agriculture in the area.
- The CEEP research community is prepared to volunteer services in support of project reviews, energy and water audits and other actions necessary to bring about culturally sensitive, environmentally sustainable, and locally sensible economic and social futures for this very special place and people on our earth.

5. SUMMARY

Multiple damming of the Narmada River and its tributaries has been called India's "greatest planned environmental disaster" (Arundhati Roy, 1999). The visit of the Study Team to the site where this project is unfolding and talking with communities being affected by the project has revealed that it is becoming a deep social and environmental wound. From inaccurately projecting the number of people that would be affected by the project to inaccurately mapping the costs incurred versus the benefits accrued, the project appears to lack justification and its vision seems deeply flawed.

While certain officials argue that only a relatively small number of people are affected by dam and canal projects, it has been noted that only those displaced by submergence are included in the PAF list. The impact of the project itself is far wider than submergence. And when that figure is juxtaposed against the number of people actually residing in the region, the proportion of lives affected paints a much grimmer picture (Vaghollikar and Das, 2010). The people of the Valley are paying for the project with their homes, their lands, their livelihoods, their identities and even their lives.

Industrial needs for water and electricity have been given priority over the needs of local people most affected by the submergence and displacement, leading to an unequal distribution of benefits. Whereas one of the major rationales for this project has been to provide water to villages, inadequate planning of the canal network and drinking water supply network has affected target achievement. Both the water supply and power generation targets are far from being realized and the distribution of water and power is materially different from what was planned, especially in Gujarat. Many places in the river valley, especially in the downstream area of the dam, would turn into dry regions as the dams upstream (SSP and others) on the river further restrict the flow.

A more democratic process of project operation enabling local populations to influence the decision-making is needed for containing the tragedy of the Narmada Valley. It is highly inadvisable to proceed with a higher height of the Sardar Sarovar Dam until all aspects of the project are understood and steps are taken with the full support of the PAF community to ensure that all pre-conditions are fulfilled, including rehabilitation of current families displaced by the project. A change in the paradigm of energy provisions is needed, shifting from centralized large scale systems to appropriate scale decentralized projects which bring more and equitable benefits with minimum environmental cost.

References

- Government of India, Ministry of Water Resources, Central Water Commission. (1987) “Guidelines for Safety Inspection of Dams.” Available at:
<http://www.cwc.gov.in/main/downloads/Safety%20inspection%20of%20dams.pdf>
- Roy, A. 1999. “The Greater Common Good.” Available at:
<http://www.narmada.org/gcg/gcg.html>
- Tata Institute of Social Sciences (2008): “Performance and Development Effectiveness of the Sardar Sarovar Project.” TISS, Mumbai. Available at:
http://www.environmentportal.in/files/SSP_Report.pdf
- Vaghlikar, N. and Das, P. (2010). “Damming Northeast India: Juggernaut of hydropower projects threatens social and environmental security of the region.” published by Kalpavriksh, Aaranyak and ActionAid India. Available on:
<http://chimalaya.files.wordpress.com/2010/12/damming-northeast-india-final.pdf>

2013년 하반기 주요 국제 행사일정

- **세계화학공학회의 (The 9th World Congress of Chemical Engineering)**
 - 4년 주기로 개최되는 세계 최대 규모의 화학공학 관련 학술대회
 - 한국에서 개최되는 금번 9차 회의는 '화학공학: 미래 발전의 열쇠(Cheical Engineering: Key to the Future)'가 주제이며, '미래사회를 위한 지속 가능발전(Sustainable Development for the Future Society)' 프로그램이 구성에 포함됨
 - 8월 18일~23일 서울 COEX에서 개최 예정
 - <http://www.wcce9.org>
- **국제환경에너지산업전 (Environment & Energy Tech 2013)**
 - 국내 최초 및 최대 환경, 에너지 및 미래 기후산업 통합 전시회
 - 9월 4일~6일 부산 BEXCO에서 개최 예정
 - <http://www.entechkorea.net/kor/index.php>
- **세계태양에너지엑스포 (Expo Solar 2013)**
 - 아시아 최대 태양에너지 전문 전시회로 전시회 출품 기업과 참관객에게 태양광 관련 최신 기술정보 및 시장정보, 시공·설계 관련 노하우를 제공하는 PV World Forum을 동시에 개최
 - 본 엑스포는 9월 4일~6일 경기도 고양 KINTEX에서 개최 예정
 - <http://www.exposolar.org/2013>
- **국제물협회 세계물회의 (The 5th IWA-ASPIRE Conference)**
 - 국제물협회(International Water Association)가 주관하는 대표적인 물산업 학회로 매회 1,000명 이상의 전세계 물 관련 전문가들이 참석
 - 9월 8일~12일 대전광역시에서 개최 예정
 - <http://www.aspire2013.org>
- **수소안전 국제회의 (International Conference on Hydrogen Safety 2013)**
 - 수소 기술 및 인프라의 안전의 진전을 목표로 함
 - 제 5회 회의는 9월 9일~11일 벨기에 브뤼셀에서 개최 예정
 - <http://www.ichs2013.com>
- **에너지-물-환경시스템 지속발전학회 (The 8th Conference on Sustainable Development of Energy, Water and Environment Systems)**
 - '지속성장'을 목표로 에너지환경 기술 및 정책 전반의 폭넓은 주제를 다루는 국제학회로 UNESCO의 후원을 받고 있음
 - 9월 22일~27일 크로아티아 듀브로브尼克(Dubrovnik)에서 개최 예정
 - <http://www.dubrovnik2013.sdewes.org/>
- **2013 연료전지 심포지움**
 - 연료전지분야의 최근 연구 현황과 결과를 발표 및 토의
 - 9월 26일~27일 경주에서 개최 예정
 - <http://www.kecs.or.kr>

■ 뉴에너지 포럼 (The 3rd New Energy Forum)

- 뉴에너지를 전 세계적으로 증진시키기 위하여 산업계, 학계, 비즈니스계 지도자들이 모이는 매년 개최되는 포럼
- 제 3회 포럼은 9월 26일~28일 중국 시안에서 개최 예정
- <http://www.bitcongress.com/nef2013/>

■ 유럽 태양광에너지 학술전시회 (The 28th European PV Solar Energy Conference Exhibition)

- 세계 최대 규모의 태양광 관련 학술전시회로 태양광발전 분야의 석학들과 기업관계자들이 참여하여 최신 학술연구 결과와 비즈니스 모델을 전시
- 9월 30일~10월 4일(학회), 10월 1일~3일(전시회), 프랑스 파리에서 개최 예정
- <http://www.photovoltaic-conference.com/>

■ F-cell 2013

- f-cell 회의와 무역박람회는 수소연료 자동차 등의 동향 및 발전을 포괄하고, 새로운 적용 분야와 특수 시장을 강조하며, 에너지 저장을 위한 수소의 잠재력을 검토함
- 본 이벤트는 9월 30일~10월 2일 독일 Messe Stuttgart에서 개최 예정
- <http://f-cell.de/home>

■ 세계에너지총회 (The 22nd World Energy Congress, WEC)

- 1924년 이후 3년 주기로 개최되는 세계적 권위의 에너지 관련 국제회의로 100여개국 기업, 정부, 국제기구, 학계, 협회의 에너지 분야 전문가 및 관련자들이 참여
- 금번 제 22회 세계에너지총회의 주제는 '내일의 에너지를 위한 오늘의 행동 (Securing Tomorrow's Energy Today)
- 10월 13일~17일 대구광역시에서 개최 예정
- <http://www.daegu2013.kr>

■ 아시아-태평양 재생에너지 포럼 (The 3rd Asia-Pacific Forum on Renewable Energy)

- 본 포럼은 아시아-태평양 지역의 신재생에너지 발전의 지식과 이해를 공유하기 위한 것이며, 최근 연구를 통한 재생에너지 사업 및 첨단 기술의 산업 적용에 초점을 맞춤
- 제 3회 포럼은 11월 4일~7일 제주도에서 개최 예정
- <http://www.afore2013.org>

■ 글로벌태양광학술대회 2013 및 아세아니안 염료감응 및 유기태양전지 학술대회 (Global Photovoltaic Conference 2013 (GPVC 2013) & Aseanian DSC-OPV)

- 금번 회의는 연구와 산업 모두의 진전을 검토하고 촉진하기 위한 국제 포럼을 지향
- 회의는 재료부터 시스템까지 태양광의 전 분야를 포괄하며, 시장개발 및 정책과 같은 비기술 영역도 포함
- 11월 23일~26일 부산 BEXCO에서 개최 예정
- <http://www.gpvc.kr>