

Stakeholder Meeting

May 5, 2016



UNDERSTANDING IMPACTS OF RENEWABLE ENERGY SCALE-UP ON ECOSYSTEMS AND BIODIVERSITY IN INDIA



Summary Report

WWF-India
(Climate Change &
Division)

GEER Foundation
(Ecological Education Energy
Wing)

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1 Background

India is in the forefront of the global movement to make renewable energy (RE) the “new normal”. The 2nd largest nation in the world in terms of population with burgeoning energy requirements to feed its fast growing economy and provide electricity access to more than 300 million people, renewable energy has become an important part of the energy equation over the past few years. Recently, the Indian government included a cumulative renewable energy target of 175GW by 2022, which primarily includes 100GW of Solar and 60GW of Wind energy. Furthermore, in its INDC submission the Indian government has mentioned its goal of achieving about 40% cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030. These ambitious targets will not only contribute to domestic efforts in reducing CO₂ emission, but will also ensure energy security, alleviate poverty, improve public health and help grow India’s economy.

At the same time, there is a strong linkage between energy usage, climate change impacts and social and ecological processes. We need to better understand these impacts and develop strategies for adaptation for both people and wildlife. Thus, it is important to carefully study, understand and take appropriate measures so that this scale up in renewable energy happens in an ecologically sustainable manner.

In this regard, WWF-India has also undertaken a preliminary analysis of the developments in the renewable energy sector (primarily solar and wind), and the associated impacts on biodiversity, based on information compiled from international and national case studies. There is relatively less research done on the impacts of renewable energy projects; however some impacts have been widely reported both nationally and internationally. For instance, mortality of birds as a result of collision with wind turbines has been documented in a number of studies but the detailed information on when, why and how often are not understood well. With regard to solar projects, large scale plants may impact natural ecosystems especially in deserts which are a viable terrain for location of solar plants. This would be presented during the stakeholder meeting to initiate the discussions. Moreover, experts from different organization would also be requested to present their work.

2 Objectives

With the above background, WWF-India and GEER Foundation jointly organized a stakeholder meeting on “*Understanding Impacts of Renewable Energy Scale Up on Ecosystems and Biodiversity*” at Gujarat Ecological Education and Research (GEER) Foundation, Indroda Park, Gandhinagar, Gujarat on May 5, 2016. The stakeholder meeting was convened to discuss issues related to ecological impacts of renewable energy and deliberate future strategies. Key stakeholders from government, research/academic institutes, project developers, and civil society organizations are expected to join the deliberations. The key objectives of the meeting were:

- To take stock of the existing work on the ecological impacts related to renewable energy and share findings of the preliminary study
- To enhance understanding of impacts of scaling up renewable energy projects (solar and wind) on ecosystems and biodiversity

- To deliberate strategies that can help achieve scaled up renewable energy targets with minimal impacts on ecosystems and biodiversity
- To list suggestions for further work, including engagement with relevant stakeholders and institutions

3 Workshop Structure

The workshop was held on May 05, 2016 in Gandhinagar, Gujarat and was structured around two main technical sessions - Understanding Impacts of Scaling up Renewable Energy Projects (Solar and Wind) on Ecosystems and Biodiversity and Exploring Strategies for Ecologically Sustainable Renewable Energy Deployment in India.

Key stakeholders from government institutions, civil society, think tanks, project developers, academic institutions and research organizations, were invited to deliberate upon assessing existing work on the ecological impacts and possible potential ecological impacts of massive renewable energy scale up in India. Apart from identifying issues and impacts, the later session was designed to discuss best practices in biodiversity management and possible management strategies in terms of policy, technical and capacity aspects. Based on the feedback and inputs from the meeting, certain action points were identified for further detailed analysis as well as synergies with initiatives undertaken by other organizations would be explored.

4 Opening Session

4.1 Welcome and remarks – Shri D.B. Ande, Director, GEER Foundation

On behalf of GEER Foundation, Sh. Ande welcomed the workshop participants and emphasised on the role of non conventional energy sources in meeting country's burgeoning energy demand in a sustainable manner. Referring to India's INDC submission, Sh. Ande mentioned Government of India's (GoI's) ambitious goal of achieving about 40 per cent cumulative electric power installed capacity from non-fossil fuel based energy resources by 2030. He emphasized on the need for better understanding of impacts of scaling up renewable energy projects (solar and wind) on ecosystems and biodiversity. Sh. Ande urged the participants to use this platform effectively and to have fruitful deliberations on the next steps and way forward for ecologically sustainable scale up of RE in India.

4.2 Workshop Background – Dr. Sejal Worah, Programme Director, WWF-India

After a brief introduction on WWF-India's work on promotion of renewable energy in India, Dr Worah spoke about the recent announcement by Ministry of Environment, Forests and Climate Change to include renewable energy (solar power generation through solar photovoltaic cell, wind power and mini hydel power (less than 25 MW) under the newly-introduced White category industrial sectors. She highlighted that there is a clear linkage between massive RE scale up and potential ecological issues, and as policy makers and environmental organizations, we must be conscious of possible long term impacts of these renewable energy projects. She also emphasized that there is a need for addressing this issue and develop management strategies for reducing ecological impacts. One of the ways could be to bring industries/project

developers onboard and make them aware of the necessity to consider potential ecological impacts in the planning phase of a project. Citing the example of CII's India Business Biodiversity Initiative, she suggested creation of similar consortium to help encourage 'industry champions' who could integrate ecological considerations in their projects. Further, bridging knowledge gap was also suggested as a key activity. Lastly, Dr. Worah advocated the need for enhanced collaborative efforts and activities amongst different stakeholders, especially between renewable energy and biodiversity groups.

4.3 Background Presentation – Dr. T S Panwar, Director, Climate Change & Energy Division, WWF-India

With an aim to provide a brief overview on the linkage between RE and biodiversity, Dr. T.S.Panwar presented the findings from WWF-India's preliminary assessment of ecological impacts of RE projects for India. The presentation highlighted the current status of renewable energy in India with particular emphasis on Gujarat. The talk also included documented impacts (both international as well as domestic) of RE projects on ecology, thus providing key pointers for the subsequent session discussions.

4.4 Special remarks by Shri Poonamchand Parmar, IAS, PS, F&ED, Government of Gujarat

Sh. Parmar highlighted the importance of electricity and industrial services in our daily life. Referring to electricity, he mentioned positive changes brought by this form of energy in different aspects of our lives such as health, education, livelihood, etc. Stressing on the need for environmental conservation, Sh. Parmar opined that a balance has to be created between developmental needs and environmental impacts. As a way forward, Sh. Parmar suggested that a second round of stakeholder interaction could be convened to further discuss the issue of ecological impacts of RE projects. This follow-up meeting could additionally include key organisations including project developers and some of the other government departments who could not join the current deliberations. He said that the summary of action points from this meeting would be a good starting point for the next round of discussions.

4.5 Remarks by Dr. J. A. Khan, PCCF Wildlife, Gujarat Forest Department

Dr. Khan highlighted that natural resources are meant for the benefit of society but must be utilized in a sustainable manner. Dr. Khan mentioned that RE has grown significantly in last few years, especially in Gujarat. Referring to the government's ambitious RE target, he emphasized that this rapid RE development could create impacts on the ecosystem in a longer run. Thus, he emphasized on the need to develop more knowledge and research on the subject and to look for precautionary measures and means to tackle the problem. He further said that solar power is supreme and there is need to bring in more share of solar and wind energy in the power sector.

5 Technical Session 1: Understanding Impacts of Scaling up Renewable Energy Projects (Solar and Wind) on Ecosystems and Biodiversity

The objective of this session was to understand impacts of RE projects on ecosystem and biodiversity and was chaired by Dr. J. A. Khan, PCCF Wildlife, Gujarat Forest Department. Three distinguished speakers presented their research findings on the theme.

5.1 Overview Presentation – “Environmental Impacts of Wind power”- Dr. P R Arun, Principal Scientist, Salim Ali Centre for Ornithology and Natural History (SACON)

Dr Arun focussed on the environmental impacts of wind farms, presented case studies from the field and listed broad recommendations to reduce environmental impacts. He reflected on the various environmental impacts that wind farms have on the ecosystem, especially on avifauna and terrestrial mammals. Some highlighted impacts included reported reduction in bird population or absence from, the area close to the turbines (up to 600m from the turbines), for some species such as the whooper swan - *Cygnus Cygnus*, pink-footed goose - *Anserbrachyrhynchus*, European white-fronted goose - *A. albifrons*, Eurasian curlew - *Numenius arquata*. Other associated impacts included habitat changes - degradation/fragmentation/loss causing displacement & exclusion, barriers for faunal movements along migratory paths, causing direct mortality by collision, barotrauma & electrocution, noise pollution, shadow flickering, aesthetic impacts and increased human activity (in wild areas). Speaking about off shore wind farms, Dr. Arun opined that the offshore turbines can have adverse effects on avian food resources such as benthos and on fish population as a consequence of the effects of electromagnetic fields around under-sea power cables. Also, these aspects require further study to clarify whether or not there are significant issues of concern. One of the key concerns raised during the presentation was the need for robust, objective baseline studies. Currently, there is very little data (temporal & spatial) available in India. He also talked about the absence of data relevant to the current technology since most of the studies have been of small turbines, often in small clusters; the implications of newer, larger turbines and larger wind farms may be different. Also, the actual rate of collision is often under-recorded as there is a lack of data specific to diurnal and nocturnal fauna.

Dr Arun also presented the research findings from the two wind farms (Jangi, Gujarat and Hara wind project in Karnataka). The study findings indicate that annual Bird Mortality/turbine in Jangi was 0.38 and 0.47 in Hara. However, he also added that these mortality values are far less compared to reordered values in other countries (35 in Boudewijikan, Belgium and 64 in El Perdon, Spain).

As recommendations, he suggested that project developers and government should promote and adopt new/ emerging technologies (longer blades & thus increased rotation speed), use modern turbine designs optimized for maximum power at minimum risk, use of flashing lights (recent studies suggest that avian fatalities can be reduced by replacing non-flashing/steady-burning red lights with red strobes, white strobes, and red, incandescent, flashing lights), creating wide corridors between clusters of turbines for barrier effect mitigation, promote detailed studies & EIAs on wind power projects to learn and improve technology through scientific feedback loops.

5.2 Overview Presentation – “Understanding the Impacts of Renewable Energy (wind mills) Scale Up on birds and bats – policy requirements in India”- Mr. Sujit Narwade, Scientist, BNHS-India

Mr Sujit Narwade made a presentation on existing guidelines and methods of investigating impacts on birds and bats in relation to utility scale wind energy projects. He highlighted current reporting (domestic as well as international) of avian mortality due to wind turbines, for example, Indian Bird Conservation Network (IBCN) members reported bird deaths in Thar Desert in Rajasthan. Direct mortality or lethal injury does not result from collisions with rotors alone, but also due to collision with towers, nacelles and associated structures such as guy cables, power lines and meteorological masts.

Collision risk is likely to be greater on foraging and roosting sites of birds, or on migratory flyways or local flight paths, especially where these are intercepted by the turbines. The fenced off areas under windmills (closure areas) have been observed to attract small mammals and reptiles. These, in turn, attract birds of prey which also run the risk of colliding

with the wind mills. Speaking broadly on wind energy & wildlife interactions, Mr. Narwade listed the following potential impact on wildlife population and habitat - disturbance & displacement, behavioural change in wildlife, habitat loss, disorientation of bats, collision and barrier effect.

The suggested steps for studying the impact of windmills on biodiversity (especially birds and bats) were:

- During Permitting Process: Project proponents and permitting agencies should be familiar with the Indian Wildlife Protection Act (WPA) and IUCN categories of threatened species during the permitting process. Identifying general mitigation goals into four categories as suggested by international protocols and developing adequate mitigation plans for habitat losses.
- Pre-construction study: Conducting surveys for documenting species diversity and abundance of birds and bats and establishing their flight patterns and distribution at the project site and a nearby reference site or controlled sites.
- Construction phase: Construction activities should be organized and timed to minimize impacts on wildlife.
- Post-construction monitoring and reporting: Should include bat and bird use surveys in the vicinity of wind turbine bases.

Mr Narwade further explained that wherever possible, transmission cables should be made underground (subject to habitat sensitivities and in accordance with existing best practice guidelines for underground cable installation), installing bird reflectors on the overhead cables, avoiding areas of high bird concentrations, especially for species vulnerable to collision and timing project construction timeline to avoid sensitive periods (breeding and nesting periods), etc. Lastly, one of the key recommendations from the presentation was to create awareness about wildlife response to wind energy development thus enabling effective recommendations to avoid/minimize/mitigate impacts.

5.3 Overview Presentation - Dr. Satish Pande, Director, Ela Foundation

Representing Ela Foundation, which works extensively on avian species, Mr. Pande spoke about the impacts of RE projects on avian species. Emphasising on the need for impact assessment of RE projects, Mr. Pande highlighted following key aspects/factors on which extent of ecological impacts would depend upon:

- Project completion time - longer the project takes for completion, higher the impact risk factor.
- Ambient/site conditions: whether the project site is in proximity to eco-sensitive zones.
- Local biodiversity: Habitat locations of endemic species, migratory routes, feeding, roosting and nesting sites of migratory species.

Citing references from recent research studies, he highlighted that in some cases, RE projects have led to change in local landscape and species distribution. For instance, RE projects (especially wind farms) have led to transformation of forest lands into grasslands, thus leading to species variations in that local ecosystem. Dr. Pande also talked about the phenomenon of “Environmental Magnetism” recorded in the US, in which avian species display site fidelity which has led to decline in local bird populations.

Some broad level recommendations were also mentioned. One the main suggestion was to create a clear demarcation between go and no-go areas for RE project development. He opined that there is an urgent need to develop extensive

and comprehensive criteria for these areas and it would be helpful for project developers to effectively site their project locations. This would, in turn, reduce environmental impacts and risks for project developers. Lastly, he suggested that the survey document pertaining to environmental impacts of RE projects should be in the public domain.

Discussions:

The presentations were followed by open discussions which brought up some relevant issues and ideas. There was consensus on the need for long term studies and analysis for understanding ecological impacts of wind farms. Stakeholders also agreed that before going for centre/state level mandatory EIA for wind projects, scientific community needs to extensively document the significant impacts, if any. Project siting and land acquisition emerged as one of the key aspects that project developers and local authorities should factor in their pre-project planning stages. Further, the focus of ecological impacts should also cover the entire lifecycle of solar and wind energy projects (from cradle to grave). Lastly, there is a need to develop a country level map that shows potential RE project sites and defining eco-sensitive areas categorised as vulnerable, less vulnerable, etc. This national level map would help project developers in siting RE projects, get necessary clearances and avoid environmental impacts, which in turn, would help India achieve its RE scale up target in an ecologically sustainable manner.

6 Session 2: Exploring Strategies for Ecologically Sustainable Renewable Energy Deployment in India

The objective of this session was to highlight and discuss the most promising examples of mitigation measures, policy mechanisms and best practices (applied domestically and internationally). It also intended to deliberate on the reasons for limited adoption of these practices and what needs to be done so that these are adopted on large scale by government and project developers. The session was moderated by Dr. Vijaykumar, Director, Gujarat Institute of Desert Ecology (GUIDE).

6.1 Overview Presentation - Mr. GM Pillai, Director General, World Institute of Sustainable Energy (WISE)

Mr. Pillai opined that when compared to conventional energy generation sources, renewables are environmentally benign sources of energy. However, the degree of environmental sustainability may vary from technology-to-technology even among renewables. Any economic activity of humans requires natural resources and in some way or the other, impacts nature - the difference is only in the level of impact. Further, solar and wind sources are renewable, however the technologies to harness them are not. For example, manufacturing a wind turbine is not a very polluting process, nevertheless, the heavy material requirements of a turbine (upwards of 130 tonnes per turbine) have life-cycle ecological costs in terms of their mining, processing, transportation, waste generation, etc.

Mr. Pillai also highlighted that most of the ecological issues related to wind projects are due to project activities such as transportation, erection, construction and operation of turbines. For transporting 50 tonne generators and 160 foot blades to the mountain sites, project requires building new roads on hills/mountains. Also, sometimes large stretches of land need to be cleared for power lines and transformers. These project activities in turn affect biodiversity, livelihoods and

ecosystem services provided by such areas. Similarly, speaking on environmental impacts of solar energy, Mr. Pillai mentioned that key components like panels and batteries used in solar projects have significant environmental impacts over their entire lifecycle.

The possible solutions (to make RE environmentally sustainable) suggested were:

- Forested areas, lands of indigenous people and agriculturally productive lands should be excluded from RE deployment. For solar energy, greater emphasis on rooftops would help.
- Closed loop manufacturing systems and recycling of RE waste should be legally mandated (or voluntarily accepted) to ensure minimizing leaching of pollutants into the environment.
- Substitutes and new processes should be developed for avoiding the use of highly toxic chemicals, fossil fuels (and their derivatives) and water used in RE manufacturing and maintenance.
- RE should be increasingly deployed for energy substitution and livelihood improvements.
- Policies and strategies should be devised to make RE power generation economically viable and competitive with fossil-based generation, e.g. cess on coal to be deployed for providing low-cost debt to RE projects.

6.2 Overview Presentation – “Some Issues related to Renewable Energy Projects & Biodiversity” - Dr. Bharat Jethva, Biologist

Speaking from his field experience, Dr. Jethva provided useful insights on the issue of impacts of wind farms projects on avifauna. Talking about various cases and project sites, he emphasised that apart from collision with turbine blades, electrocution due to transmission cables is one of the major reasons for avian mortality. He said that to understand the impacts, one has to look at localised conditions like local migratory patterns, feeding and roosting areas, etc. While speaking about the 400 KV High-tension Power line Project by Adani Power Limited in Rann of Kutch North of Adesar, he explained different strategies (such as bird reflectors and underground cables) that could be employed by other project developers in the sector.

6.3 Overview Presentation – Mr. Dipak Panchal, Business Development Manager, Adani Green Energy

Mr. Panchal talked about different aspects of rooftop solar technology in India. He presented different technology variations available in the Indian market for different sectors like residential, industrial and commercial consumers. He also spoke about different business models that are being offered by companies such as CAPEX and OPEX model. Different policy and fiscal initiatives taken by the government (both centre and state) were also mentioned in the presentation. In particular, technical and financial mechanisms of ‘Net Metering’ and ‘Gross Metering’ were highlighted.

Discussions:

Other comments from the session highlighted the importance of conserving ecosystem and at the same time promoting scale up of RE as a solution to meeting country’s energy demand in a sustainable manner. Stakeholders agreed that different actors like government, private sector and civil society should work towards balancing development and environmental sustainability. System thinking approach and long term vision of environment and energy sustainability encompassing local livelihood, rights of tribal communities emerged as an overarching conclusion from the session. Lastly, in order to achieve this, there was consensus on the need to bridge the knowledge gap and enhance capacity of key stakeholders like project developers and government officials on these issues. An important point highlighted was that

baseline research studies need to be undertaken which would help in creating knowledge pool for future discussions and initiatives on this theme.

7 Way Forward

Dr. Sejal Worah, Programme Director, WWF-India summarised the proceedings and suggested the way forward for this discussion. It was pointed out that the government's ambitious RE target is a significant step towards meeting India's growing energy needs in an ecologically sustainable manner. However, one must also take into consideration any possible long term *cumulative implications* on the ecosystem and RE sector development should happen in a more informed way. It was clarified that the entire discussion has to be seen from a positive perspective whereby we have an opportunity to bring in best practices as the RE sector scales up in India. It was also emphasised that the knowledge base and the level of policy to address the challenges of ecosystem and RE linkages are yet to be properly understood. And there is a need for more detailed data generation (on baseline, impacts, best practices, etc.) for more comprehensive and informed decisions. Thus, there is an urgent need for collecting detailed information on cumulative impacts of RE projects on ecosystem which should include notion of how projects link together in a larger geography and then assessing the impacts. Assessment of cumulative impacts should also encompass *indirect impacts of RE projects like lifecycle impacts of solar and wind technologies (including manufacturing process and disposal options)*. It was stressed that project siting is one of the most crucial aspects in managing ecological impacts of RE projects. Acquisition of land is another important aspect that deserves attention. Further, besides tree cover, there is need to look at other ecosystems as well – grasslands, plateaus, etc.

Dr. Worah opined that private sector is a key stakeholder and it's crucial to get them on board to help them understand and make them aware of the impact assessment and develop guidelines (or certain do's and don't's) to minimize ecological impacts of RE projects in India. This is the right time since the RE momentum is now building up in the country. It was suggested that a couple of states could be chosen to carry out a mapping of the vulnerable, less vulnerable areas, etc from an environmental perspective that would be helpful as a baseline tool for the industry. GEER expressed an interest to carry out a mapping assessment for the solar sector in Gujarat. Dr Pande mentioned about the possibility of doing a mapping assessment in Maharashtra. WWF-India mentioned that a best practices compendium could be developed wherein different organisations/experts could contribute to it. Some of the solar parks under development could be considered for carrying out the baseline studies so that the impacts could be assessed during the course of the project and remedial measures incorporated wherever feasible. The various research organisations could suggest ideas for long-term studies and research that could then be placed for potential funding support to different agencies, including the government. Different organisations/research institutes could indicate their thrust areas where they would like to be engaged. It was also pointed out that the social dimension is also important to be considered and the ways in which the villagers could be made part of the development story.

Later during a meeting with the Director GEER Foundation, he emphasised that one must keep into consideration that the impacts due to RE are much less as compared to other forms of fossil fuel based energy systems. At the same time, it is important to quantify whatever impacts are caused by RE and for this it is important to study in detail the areas where RE projects have come up. This would help in formulating appropriate environmental safeguards.

8 Action Points

Following are the actions points that emerged from the discussions:

- **Undertake research studies in selected state(s) to assess and understand long term ecological impacts of renewable energy projects.**
- **Carry out a state level mapping and zoning assessment (this would include spatial and temporal assessment of various parameters and criteria such as renewable energy potential of the state, eco-sensitive zones, hazard mapping, etc.).**
- **Developing a compendium of best practices (international and domestic) in minimizing impacts of renewable energy project on ecosystem.**
- **Engage with the various stakeholders (including the RE developers, government officials (policy makers and regulators), research and academic institutes, and NGOs/civil society groups) to discuss the ongoing developments and take a longer term view to promote ecologically sustainable RE scale-up.**

Director GEER Foundation mentioned that the minutes of meeting along with these key action points could be forwarded to the Principal Secretary for his kind consideration. A follow-up meeting could be convened for further discussion on the subject whereby a list of key organisations could be drawn up, including the project developers and some of the other government departments who could not join the current deliberations. The intension would be to ascertain the best practices which some of the developers are following and whether these could be replicated on a wider scale. Also, further deliberations would help in coming up with concrete actions points and collaborative efforts by different organisations.



UNDERSTANDING IMPACTS OF RENEWABLE ENERGY SCALE UP ON ECOSYSTEMS AND BIODIVERSITY

May 5, 2016

Gujarat Ecological Education and Research (GEER) Foundation, Gandhinagar, Gujarat

Programme Schedule

09:30-10:00	Registration
10:00-11:00	Opening Session Welcome and Remarks by – Shri D.B.Ande, Director, GEER Foundation Remarks by Dr. Sejal Worah, Prog. Director, WWF-India followed by background presentation Remarks by Dr. J. A. Khan, PCCF Wildlife, Gujarat Forest Department Special remarks by Shri Poonamchand Parmar, IAS, PS, F&ED, Government of Gujarat
11:00-11:15	High Tea
11:15-13:00	Technical session-1 – Understanding Impacts of Scaling up Renewable Energy Projects (Solar And Wind) on Ecosystems and Biodiversity <i>Session Chair: Dr. J. A. Khan, IFS</i> <i>Presentations by:</i> Dr. P R Arun, Principal Scientist, Sálim Ali Centre for Ornithology and Natural History (SACON) Mr. Sujit Narwade, Scientist, Bombay Natural History Society (BNHS) Dr. Satish Pande, Director, Ela Foundation <i>Open Forum</i>
13:00-13:45	Lunch
13:45-15:00	Technical session-2 – Exploring Strategies for Ecologically Sustainable Renewable Energy Development in India <i>Session Chair: Dr. V. Vijaykumar, Director, GUIDE</i> <i>Presentations by:</i> Mr. G M Pillai, Director General, World Institute of Sustainable Energy (WISE) Mr. Dipak Panchal, Manager - Business Development, Adani Green Energy Dr. Bharat Jethva, Biodiversity Expert <i>Open Forum</i>
15:00-15:30	Way Forward Summarizing the meeting and key points emerging out of the discussion – Shri D.B.Ande, Director, GEER Foundation & Dr. Sejal Worah, Programme Director, WWF-India
15:30	Tea

