IMPROVED COOK- STOVES ; YET TO BE A SUCCESS STORY.

----- C.V.Krishna

Abstract.

The Project on Improved Cook Stoves was launched as back as in 1983. The Aims & Objects of the Project were very a clear and loud, such as :-

- Designed as a Program for Women and by Women.
- Conservation of Fuel wood. / 'Helping Solve the Cooking Energy Crisis'.
- Built up of a Clean Environment and averting health hazards of Fuel-Smoke.
- Lessening of the Drudgery to Children and Women in fetching fuel-wood.
- Creation of avenue for Income generation for Rural Women.
- Lessening of Forests' denudation.
- Creation of Employment Potentials to Rural/Small Industries and village Artisans.
- Any Other.

Today, after 20 Years of the run of the Program, the Technology is yet to be accepted by the Rural and urban beneficiaries. In spite of several debates, workshops, appraisals, publications, the Program continues to be implemented depicting the numbers of Stoves as 'Disseminated', rather than 'Functional'.

The Paper analyses the defects/missing links in the project providing the scenario of Orissa(one of the provinces of Eastern India and suggests a number of Solutions.

THE PROECT.

- The National Project on Demonstration of Improved Chullas (NPDIC), begun in 1983. Several Improved Models of Chullahas were demonstrated all over the Country.
- During the last three months of the Financial Year '83-84, the targets were as ' One Lakh (0.1 million) Chullhas to be built, through 1000 Training Courses, each of 10 days duration to be organized to reach Village Women to build these Chullhas. An amount of Rs. Nine Crores(90 million) was set aside for the project.
- By the end of the Year 84-85, 7.56 lakhs(0.756 million) Chullhas were to be built, resulting in saving of Six lakhs tonnes of fire-wood.
- From April 1986, 'The National Project on Demonstration of Improved Stoves' of the Department of Non conventional Energy Sources (DNES),(now, Ministry Of Non Conventional Sources (MNES), graduated to ' The National Project on Improved Cook Stoves'(NPIC), a regular project integrated in the Seventh Five Year Plan ; the implication that 'Demonstration' phase has been successful !!!
- The Design of the project is a '**Program For Women and by Women'** to '**Help in Solving the Cooking Energy Crisis'.**

- The aims of the Project are:

1. **Conservation of Fuel wood.**
2. **Avert Health Hazards of the Kitchen Smoke.**
3. **Reduce the Drudgery to Women & Children in fetching /Collecting firewood.**

4. **Save Trees/ Denudation of Forests.**
5. **Avert Environmental Hazards.**
6. **Generate Employment Opportunities to Rural Women as well, the Small Scale Entrepreneurs by manufacture and sale of Portable Stoves and Chimneys, Cowls etc.**
7. **Any Other.**

THE GROUND WORK.

- Improved Cook Stoves between 10 to 20% Efficiency were demonstrated throughout the Country (subsequently the Efficiency range was increased to 20% as Minimum for dissemination).
- Two varieties were chosen such as, the Fixed Model and the Portable one.
- Non Government Organizations (NGOs)/ Self Employed Workers(SEW)/ Self -Employed Entrepreneurs(SEE) are to be trained in installing/ Understanding the Technology of the Stove to become the Trainers while building the Stoves, and thus help in growth of the Tribe in the Rural Villages.
- The above Groups to have maximum number of Women as Trainees/Trainers, as basically the 'Chullha' belongs to Women!!!
- Funding of number of Training Programs is the back bone for growth of the Project.
- Subsidy is the other allurements for quick acceptance of the Chullha for installation.
- Targets for each State are fixed every year, basing on the performance of the previous year.
- Evaluation Studies continue to be conducted for the entire Project by a professional body almost every year.
- State and National level Workshops/Seminars/Exhibitions being conducted provide much insight on the Technology Development and Interactions.
- To reinforce further, Technical Backup Units have been sanctioned to each State so that the Technology dissemination is appropriate to the respective state, in a decentralized manner.

THE OUT COME AS ON 1-4-2000.

- On record, 312 lakhs / 31.2 Million Chullhas have been installed from inception.
- At the rate of at least three NGOs/ SEEs/SEWs on an average, per block in the country, more than 10,000no.s have the Training and thus have the Employment.
- As per MNES calculation, the saving of Firewood is to a tune of 21.84 million tons.
- As on date more than 80 models of 'Improved Stoves' have been developed.
- On record, the Survival rate of Chullhas is 'Satisfactory'.

THE GRASS – ROOT TRUTH.

This following Chronology of statements is based on introspection of the Project year after years by the Author; the written analysis of Eminent Social Workers, Professors of leading Academic & Research Institutions namely the Indian Institute of Technology and others, Professional Technologists, Field level functionaries of the Country; admission of Senior MNES officials of the investment on the Program for the period between '85-86 to '92-93 as a failure and the claims of fuel wood saving as exaggerated ; Observations of National Council of Applied Economic Research (NCAER),who were the Evaluating body of the National Project for continued years. Also the Evidence from the Fields of different Provinces contribute to this Chronology of Grass-Root Truth corroborating to the above mentioned tribe working on chullha.

(Most of the leading NGOs, Experienced SEEs & SEWs in the Country have washed their hands with the Project, after Self Evaluation mainly for two reasons: One is, it is not worth the financial returns, the Other is from point of view of non sustainability and ''temporary nature' of work.

The Chronology:

1. A lot of Chullahas have not been installed; materials lying without installation, but accounted for as 'Installed'; Misreporting is to a tune of 30%, if not more.
2. Out of the Installed, a high percent are in two major conditions, such as, 'Dismantled' and 'Not in Use'.
3. Out of the Chullhas in use, many have INCREASED the fuel consumption rather than decreased it.
4. Many do not remove Smoke from the Kitchen, as the Chullha was not installed correctly.
5. Hardly 10% of the Chullhas have survived and in use 'Casually'.
6. The percentage of ' Women' in Training, Building, Repairing is hardly 5% of the Trained SEE (Self Employed Entrepreneurs) s and SEW (Self Employed Workers) s; the NGOs too have Male Trainers than the "Women' in higher percent as Trainers/Builders.
7. The Program has become a Source of Earning for most of the SEEs, SEWs and a Service Symbol for NGOs.
8. More than 80% Chullhas have been installed, because of "Subsidy".
9. 38% of the Beneficiaries never use Fire Wood as Fuel for their Cooking; all these Improved Stoves use only Fire Wood!!!

10. Average life of a Chullha is roughly 31 months, varying from 3 months to maximum 48 months. The Percentage of different stages are as:
    - 3 months ----- 37.4%
    - 4-6 months ---- 20.8%
    - 7-9 months ---- 9.2%
    - 10-12 months – 14.1%
    - 13-18 months --- 11.3%
    - 19-24 months --- 7.5%

    TOTAL 100
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11. Efficiency of an Improved Chullha in field condition as compared to traditional one is only 1.38 times .
12. One of every 4 fixed improved chullha has an efficiency which is less than or equal to traditional chullha at All India level. Portable chullha is 1.4 to 1.55times efficient than traditional chullha.
13. Users' Training imparted to 40% only; the balance are unaware of the training.
14. Rs. 80 Crore(30 million US $) investment on the Project between '85-86 to '92-93 has been a failure and that claims of fuel wood saving are exaggerated--- Admission of Senior MNES officials.
15. Dissemination of knowledge, which is crucial to the success of the program has been lacking.
16. Targets fixed by MNES have no bearing with Quality of Chullhas.
17. Whenever the new models of chullhas are proposed, the two basic claims emphasized are either the model being more wood thrifty or it being smokeless or both. Qualification of these claims is seldom presented.
18. The Chullha installed does not suit to the Cooking habits/Practices of the user, fuel in use, size and geometers of the utensils in use.
19. The Chimney installed has been the source for fire hazards ; the periodic cleaning of the soot is cumbersome as well, is threatening to roof thatch condition.
20. The 'Potter linings' are not available; the potters do not have ready stock nor available readily in any 'hat'(village market) . 'Terracotta' ones are not at all available.
22. The 'Fire Place' is too narrow and does not suit to the size of firewood in use.
23. The 'Chimney & Cowl' have been removed as the rainwater percolated through the cowl.
24. 'Coarse Cereal Chapatti' could not be cooked well.
25. 'Pre Training' Survey, as well Post Installation Training has not been done.
26. The 'Gauge' of Steel sheet in the portable stoves is below the prescribed standards; thus does not last more than 6 months.

27. **The Best and Stunning feed back through a counter was to this bespectacled Author from an old lady of nearly 60 years age was as:**

    - Please explain how my traditional Chullha is inferior to yours? I am content with the consumption of fuel I use. In my Chullha, I can use Agricultural wastes, Shrubs, as well Fire wood; but as I see your Chullha, it is only fit for Fire wood ; from where do I get Fire wood everyday ???
    - My eyesight is perfect; I have no complaints of any chest-prone diseases; on the other hand you are 15 years younger to me, and you have spectacles!!
    - I need smoke; for, it warms my Kitchen, as well, insects those eat away the bamboo of my thatch roof are driven away due the smoke.
    - Please let me know if you are coming every month to clean the Chimney; for, my daughter-in-law or I cannot climb the thatch top, nor my son has time from his daily labour works.
    - I construct my Chullha myself suiting to my conveniences; you are forcing a size of the Chullha whose Pothole does not fit to size of the utensils I use. Don't you have any other size or different sizes to pick and choose???
    - Every three months or so, when I rebuild my stove, from where do I get these terracotta potter liners??? From where do I get money for it? I build my stove free with local materials and the skill I acquired from my mother and mother in law ; none need teach me how to build the stove.
    - We are in Peace, Please do not disturb our system; we do not cut the Forest for our Fire wood; if you can stop the Contractors and the village touts who are joining hands with them, your so called Denudation of Forest shall not be there.

28. The most popular stoves to date in the market economics are chimneyless models, probably because they are affordable and with the exception of smoke removal, offer the best return in benefits. Chimney chullhas are very problematic and their high cost is a significant deterrent to households.
29. National Project on Improved Chullhas has the focus on saving trees in their publicity campaign as well, accounting theoretically the wood saving year after year; this has little impact, because most people know that they do not cut down trees. This mistaken focus caused a loss of credibility and is viewed as government interference in people's lifestyles.
30. THE introduction of "improved" stoves into a community is far more complex than simply designing a stove and having it widely disseminated. It is a multi-stage process, which needs to be handled with care and full community participation. Cooking and eating habits are among the most deep - rooted in any society, and alterations in this domain are highly sensitive.

31. Users were increasingly more interested in stoves for reasons other than fuel efficiency; removal of smoke, cleanliness, convenience and safety were often perceived as more important than stove efficiency.

THE REASONS.

For the last two decades, the Program has been in the field inspite of the above introspected statements, analysis, comments, observations, etc,. Let there be a debate on the above and scan the reasons which shall lead to rectification of the lacunae .
For this, let us trace back from the initial point, phase wise so that we know where we stand.

Phase I

This phase was the transition period of CASE (Commission for Alternate Energy Sources) blooming to DNES (Department of Non conventional Energy Sources.).At this time the Knowledge acquired in the Discipline by individuals, states was either nil or scanty. Preparedness of the states was not at all there; nor a prior information was there to States.

- The Project was designed as 'Demonstration', while it was being launched; but the scenario in the Country of the States was that most of them never had a separate Nodal department to deal with this. So as per convenience, some assigned to Industry department, some to Panchayat/Rural Development department, and some to Agriculture department and some states handed over the responsibilities to Universities; some states never accepted and they started late, when almost the 'Demonstration' phase faded out and 'Installation' phase was launched.
- Parallel was the scene of NGOs ; no body knew the antecedents of these NGOs; it was like a wild cat call and the empanelment of NGOs was 'As and Where' and instant !!
- The most saddening part of this phase was, few had knowledge about the 'Improved Chullha'; and none of the states were trained earlier nor had the slightest idea of the Project and its aims and objects nor the steps one has to tread serially to reach the target. The Training Programs literally were poured on the states to be completed within an impossible time period. The Efficiency of the Demonstrative Stoves was not known to most of the states, as well no technical literature was supplied as a back up paper for Training or Demonstration.
- The other gravest mistake was, at no time of point, it was made Mandatory for participation of 'Women" in the Training Programs; Sanctions were poured to meet the 'Targets' without an evaluation. Since then to date, the Involvement / Participation of 'Women' is the thinnest, though the Design of the Project is 'Program for Women and by Women'!!!

Phase II.

- This phase saw competition amongst the States for Awards for achieving /exceeding the targets!!! One year, one of the States had achieved 213% of achievement, taking a revised target in the month of February, before the close of the Financial Year! The extra target was levied on this state as one of the states was limping in achieving its target and expressed its inability to achieve the figure. At this juncture, the DNES never gave any thought about the "Practicality" of the installation; it had one goal and that was to report the achievement to the Prime Minister's Office about the success!!!
- At no time an introspection was there from the State or the DNES to think about the Technology, Quality, Acceptability of the Chullhas, Involvement of Women, Functionality, 'Mis -report" of number of Chullhas installed, or the Quality of Trainings conducted, NGOs' activity etc.
- NCAER was entrusted for Countrywide Evaluation of the Project on Improved Cook stoves as well the Biogas Development. It did come out in many chapters about the daunting targets, Non functionality, Defects in the attitudes of Sews, NGOs' role, Governmental staff's duties role played by subsidy etc,.. But, till date no remedy has been there from the Nodal or the Funding Organizations.
- Parallel and simultaneous was the sanction of TBUs (Technical Back up Units) to the states. The sanction was to establish them in Agricultural Universities or in Research Laboratories. Nodal Agency was totally denied of the functions of TBUs and the coordination was to be maintained by both to boost up the Quality of the Program. Here again, the mistakes were compounded; the assignment of TBU was to a scientist/Professor in addition to his normal duties of his own department. Usually, they are/were non touring persons as well they were strangers to the Extension and Training exercises in a village level, that too for Women. The second lapse was in some TBUs, the "Wheel was reinvented"!! They started innovating Chullhas in their laboratories and claimed the Chullha developed by them as the best rejecting all other models earlier installed without taking cognizance of the field needs!!
- By this time, the states had shifted their installation from one model to other, practically experimenting with the day-to-day consumption of fuel wood of the village women. In Orissa the present Chullha is probably numbers to 14 in such experiment. The consistency in installation was not there; the Officer in charge and the Scientist of TBU virtually became the 'Fate Deciders' of model for the state than asking the requirements / needs of the users. Virtually the TBU scientist dictated the terms, since he was also empowered to designate, certify and approve the model basing on its 'Efficiency'. DNES, now promoted to MNES (Ministry of Non conventional Energy Sources), thus, coolly washed its hands shifting the responsibilities to TBUs and States.

Phase III.

In this phase, which continues as on date, the Chullha's shape, parts, went on transformation. In the sense, to keep the 'Tunnel', 'Pot Hole', sizes in tact and to stabilize the efficiency of the chullha, the 'Liners' were developed. This, practically hand cuffed the user, giving her no choice of size suiting to her fuel, utensil sizes, conveniences etc. This rationalization suited only to a sector of users ; leaving the balance into picking their traditional chullha.

The implication of introduction of 'Liners' has not been deeply thought from overall angles. Potters training are a welcome proposition; but ensuring his market has been the handicap. The potters usually market their products in a village central to some villages; the other point for consideration is the quantum as well the profits that shall be generated out of the liner sales. Equally, the damages during their transportation are a calculated risk for the potter. Thus, in 95% of the cases, the Chullhas using potter liners have not been commissioned back after causality.

From Phase I to Phase three the use of Chimneys and Cowls continues as the saviors of Smoke and Rain water respectively. Up to the middle of Phase II period the quality of these Chimney Pipes (Asbestos) was tolerable; as the targets galloped, the quality drooped fast and the instances of 'semi cured' pipes which were transported to site to account for the numbers installed, sadly present the Misreporting Status in the villages; some broke down during transportation and the replacement was never an act on the part of the implementing agency. The Cowls face the same fate. Breakage in transport, breakage by monkeys, contributes to the non-functionality of the chullhas.

In all these phases, training plays a key role; but, unfortunately, there has not been any chronology of the training, nor a printed write up developed on the Chullha that is understandable to the user who, normally is not much literate. Training and Installation are in hand in glove/ simultaneous; they do not follow a chronology. Instances have been there of not imparting any users' training as well the Chullha after installation has not been fired to know or show the performance!! SEE/SEW/NGO, who are supposed to receive the last installment of his turnkey only on condition that he visits the installation for certain time period as a token of Post-Installation care, never have been serious, continue to receive their fees. There is no device/instrument to curb such safe escapes.

THE POSSIBLE SOLUTION.

More wool would be out, more one pulls the blanket,. It is high time that one just stops at this juncture, realizes that wood combustion is an extremely complex process consisting of several physical and chemical phases. Till a decade and halfback, this was considered as a low and simple technology. Equally the Extension of this Technology is the toughest amongst all the Conservation Practices; for, every house has a Chullha of its own and there are as many Designs and Designers as many Houses!! A congregation should seriously contribute for rectification of the above defects in the Project. The cluster should consist of Designers, Field level Functionaries, Extension workers, Trainers,

and any other who can contribute positive to the cause. The author, as a single brain, in short, is listing out the priorities: edition/addition/deletion of which, as a part or as a whole is most welcome.

1.The problem is to be sorted out in a decentralized manner: rationalization/thrusting upon of a model Chullha should be banned immediately to save the mortality rate. More clearly, each Block of a district could be chosen as a cluster, and the following studies to be conducted.

- **The varieties of fuel in use** – their percentage, and the dominating one. Mode of procurement of fuel/ cost of procurement.
- **The models of Chullhas** – Configuration –Single pot/double pot--below the ground/above the ground; the geometers and the efficiency of the same—fuel consumption on average per day.
- **The Food Cooked** --- Daily quantum and usual menu and the number of cooking done in a day.
- **Utensils in use** – Size and material in daily use.
- **Chullha builder** -- Mother/Daughter or any one—their skills.

2. Village level meeting to be held, where the participation is solely by the Women. This is a series consisting of **Extension, Demonstration, Counseling, Identifying the women chullha builders, their skills, their spare times etc.**

- The **Extension** part should be played carefully as already the damage has been done on the Technology; it should rebuild /win the confidence of the women. In need, there should not be any disgrace to accept the failure earlier happened in installing the Chullha. This shall push the ball into the Users' court.
- Akin to the configuration of the traditional Chullha in the block/ Panchayat /Village, two to three Improved, but, okayed by the users on the first look, should be installed and the **Demonstration** to be done live. Basing on sustained demonstration, opinion to be gathered for its multiplication. In case of any small change in configuration of the Improved Chullha, the same to be obeyed and carried out to find out the out come in terms of fuel consumption, conveniences etc,. The Demonstration should reinforce the confidence in the users that the change is for betterment over the traditional one.
- There shall always be a debate for the Single pot and Double pot by the Users. This is the right moment to **Counsel** them convincing the advantages in having the second pot, which not only helps in saving cooking time but in conservation of fuel as well acts as the media to expel the dreaded smoke from the kitchen. Live demonstration should break the scum and en-cash the nod to have the second pot and the chimney. The Confidence one gets from the users, shall pave way for introduction and dissemination of NPIC with its norms

and conditions in the village. This period provides opportunity in identifying the Trainers, Trainees, and SEWs etc.

- Simultaneous to this, the TBU has the task of designing /developing an improvised version of the existing improved or the traditional one so that on trial and error at the field level only it gets approval or rejection.
- Training material more to be pictorial ones, are to be generated for the Stove builders and the users. Usually in a village scenario, the builder never measures the dimensions of the chullha with a measuring tape or a linear scale; while building the chullha; she uses the utensils, her fingers, elbow, distance between the thumb to the little finger when the stretched palm for finalization of the parts of the chullha. Continuation of the linear measurements in Arithmetic language, as today the training drawings are, shall be of little use to the builders. So, the working drawings as far as possible should try to depict the measurements in the best-understood language of the user along with the normal dimensions that are being depicted.
- Pre Training and Post Training Programs are as important as the Training program itself. Since this is totally village based, the participation/leadership of the local women or NGO of the area of operation must be mandatory.
- The TBUs have a very important role to play in either redesigning developing the single pot chullha, as it is the choice of the majority. At the same time Chullhas using Shrubs, Agril.Wastes, and Cow dung cakes should be developed whose efficiency and the working conditions suit to the users as well the margins drawn by MNES.
- Chullha design has many facets to be looked after and is therefore a complex affair. This statement is from the aspect of field performance of the Chullha.The designer makes several assumptions while working out the dimensions etc. The efficiency specified by the designer can therefore be realized only if the conditions assumed are maintained. In amass application, it is impossible to ensure maintenance of such specific conditions, and if the conditions are not maintained, the performance deteriorates drastically. Sensitivity of a chullha to the change in operating conditions therefore emerges as one of the most important aspects in Chullha design. A moderately efficient design capable of offering sustained performance under field conditions will be more desirable than an extremely efficient design, which is very sensitive to operational in adequacies.
- For the above, if one probes the designers' tribe, mainly two distinct classes of people have been interested in the Technology. One is obviously the Scientific and engineering personnel and the other is the class of people who are committed to the cause of upliftment of rural masses either in individual capacity or in a group forming voluntary organizations. In my opinion, the second group, due to their grass root connections with the users can do and have been doing better job. So in developing a chullha for an area/region, the coordination or the combination of these two groups would yield rich dividends.

- Comparative evaluation data of the 80 odd designs approved and symbolized as 'Improved' by TBUs and MNES is not available. More than often, the claims made are based upon laboratory testing data. Feedback from field is as narrated earlier. The present situation therefore, has the following lacunae:

    1. Quantitative data regarding their performance is available to a very small extent, and without specific mention of the condition under which are with a result performance was evaluated.

    2. Comparison of various models is neither possible nor advisable.

    3. Fuel specification, so also the location specificity (with respect to food habits of the villagers in a particular location) has not received due consideration in design of these models.

  The success of the program as that of the implementing agency will certainly lie in making a choice of right model for each location. The chullha, should not only be efficient, but it should also be fairly insensitive to the users' modes and offer persistent good performance for a range of fuel and a range of usage.
- The last but the strongest link of the Program is the Evaluation. The Evaluation being carried out works out to a meager percent of the installation. For instance, the evaluation carried in '92 for '88-89 to 90-91 and 91-92, for the state of Orissa, the percentage works out to 0.2% only; out of 1,84,334 chullhas installed in six districts (off 13 districts) during '88 to '92, Numbers surveyed were 380 only. This would have been due to paucity of time and money. From such an evaluation, one cannot conclude or conceive the average scenario. The best method would be to distribute the responsibility amongst many professional consultants and at least get a data of 25% scenario after completion of one year of installation.

3. An improved chullha saves nothing nor provides any benefits if it is not used; similarly if it is not used in large numbers then the impact will be lass significant. Therefore the purpose of dissemination must be to share and distribute the benefits.

CONCLUSION.

From inception to date, more than 312 lakh chulas have been set up as per the official records. There is a potential for 1200 lakhs for setting up of the chullhas. This means we have achieved only 26% of the potential. MNES 's earlier calculation as every chullha saving 2 Kgs. of fuel wood per day can save 700 kgs. per year. This, in simple arithmetic, works out to a saving of 218.4 lakh or 21.84 million tons of wood. This would have been a reality than a shattered

dream if all the chullhas were in position. Even if 10 % of them survived consistently, we would have saved a fair amount of firewood by now.

The lessons learnt over years include deforestation, which cannot be solely attributed to cutting of fuel wood; conservation of fuel wood is not often a household priority and acceptance only comes about when some socio-economic issues are also improved.

The work on improved Chullhas has convinced that poverty is again a constraint to further development and better use of resources.

We must not forget that 'Chullha' itself is an unique technology and while other conservation practices are needed in hundreds and thousands, chullhas are needed in millions. Accurate way of assessing the success of dissemination is to compare levels of market penetration, which means knowing the total potential households needing an improved chullha.

The other unpalatable truth before all of us is that we have been claiming that we have identified what people's needs are, in reality much has been ignored. Time and time again, we see chullha project being promoted to achieve National Objectives, where as peoples' wishes to may be to save time, or cook more conveniently, with greater flexibility, and less smoke.

If factors such as the right cost and appropriate designs are achieved, there is still no guarantee that the chullha will be disseminated. The rate of adoption may still be further affected by the life cycles or natural replacement cycle of the existing appliance. Here again, the portable chimneyless models have a distinct advantage because the naturally have a shorter life time and involve the least disruption to the kitchen. Chimney chullhas will always be problematic in this respect because it is a major operation to fit a chimney. This, therefore, reinforces the need for chimney chullhas to be long - lasting in order to reduce frequent, major disruptions.

Experience suggests that success will not be instant or immediate: but, for betterment of the project, it shall be fair enough for all of us who are in the stream of this noble cause, to accept the facts, face them, and put the clock back to its right direction as we still have to go a long way, (three fourth of the distance) to reach our goal of Conservation and Protection of Environment. It is high time that one does not cheat himself.

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16. **Many Others.**

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