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Waste Land Development and Management - An Overview with Emphasis on Status of Goa State, India

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ABSTRACT

About 40% population of India live in villages and depends on agriculture and forest. In the last 30 years there is tremendous migration from rural to urban areas for employment and livelihood. This is not only putting extreme pressure on urban bodies but is also causing social conflicts and unrest. Thus, providing employment and livelihood in rural area is getting prime attention of the Government. In this regard various schemes are developed and implemented and they are showing the positive results. The wasteland development and management are one of the most important dimensions in this regard. Initially common method employed by NWDS (National Waste Land Development Board) to recover wasteland was to adopt social forestry. The attention paid to convert wastelands in to social forests does not seems to have achieved the intended goal, for in course of time newer areas turn into waste lands. Subsequently various other elements are added to it. Earlier little technology was involved in implementing the wasteland development and management, however since a decade or so technology is driving such initiatives. It appears plausible that the improper implementation of technology and not the technology may be the cause for the failure of waste land development in certain area or projects. This paper discusses various aspects wasteland development and management initiatives in the country with emphasis on the wasteland development status in tiny, beautiful and silver jubilee (25thState of India) state of Goa.

Key words: *Wasteland, Watershed, Goa, Mining, Deforestation,*

Introduction

About 40% population of India live in villages and depends on agriculture and forestand a considerable portion of it depend on wastelands for livelihood. This population is primarily rural, non/ semiliterate, and are from marginalized communities. Hence, there is an urgent need for their productive development.Wasteland in general is considered to be one, which will not be of any economic value. For the farmer it means a land, which requires more input than outputs. In the perspective of an agriculture engineer wasteland does not mean the above but he will see it in many avenues various causes which leads to the formation of wasteland and the possibilities of reclamation, control etc. through engineering methods. This paper presents in briefs various causes of formation of wasteland, review and assessment of the reclamation methods employed, suggested methods of reclamation and preventative measures. According to the report of technical task group established by Planning Commission in 1987 the wastelands are degraded lands that can be brought under vegetative cover with reasonable efforts.

The administrative and implementing authorities in initial years probably not succeeded to contribute in the proper transfer of technology from "lab of

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nature" leading to the greater problems of the day i.e. WASTE LANDS AND FALLOWS".

Hence there is growing interest in determining and reducing risks in the broad areas of engineering design, technology transfer, operations, facilities etc. Reduction of risk and their consequences following failures is of concern to regulatory agencies, administrative personals and implementation authorities. The role of academic exercise and back-up facilities in tuning and toning the dimensions of the-rest arrest the focus in no small measure. It is well understood that the anthropogenic and natural catastrophic take their toll due to population pressure, modern technology and the exploration of finite resources. In last decade or so technology is driving the various aspects of society and so the wasteland development and management.

Causes of Westland and Formation

The various uncontrolled activities added with natural phenomenon leads to the formation of wastelands. Fast industrial growth and urbanisation are main reasons for deforestation, which leads to formation of wastelands in more than one way. In addition to deforestation there are other various engineering activities, which also leads to the formation of wasteland. Some prominent and important causes are discussed below in brief.

Deforestation

The main culprit is the man who regards the forest with little care. The ecology and environment can be protected for the future, viewing it in to the long-term resources and economy. Deforestation gives us short-term economic returns like wood, furniture, papers etc. Also, the urbanisation and industrialisation have boosted the deforestation to a greater extent during the last couple of decades (overlooking the various benefits we got and the losses we experienced, can it be compared?). As the great environmentalist Sundarlal Bahuguna said "a tree which is worth of Rs. 20,000/-in terms of timber, would yield in its lifetime, when managed properly more than Rs.5 lakh in addition).

According to an International satellite survey, reveals that 16 to 20 million hectares of forestland is reducing per year leading to adverse geological, ecological and environmental conditions and today world globe is on a critical stage. In 1984, satellite survey for India revealed that we have 67 million hectares of area under forest (75 million hectares according to Forest Department?). Out of these 463 million hectares was under good forestation in 1972-73 and which reduced to about 35 million hectares in 1980-81. Today we have about 24 million hectares under good forest which is about 8% of the total surface area of the country against 33% as recommended by Forest Department document (1952) and reiterated by National Forest Policy of 1988.

As far as Goa is considered majority of mining activities are located in forest area and it has significantly affected forest cover According toNaik (1998) 70% mining activities in Goa are carried out in forest area and this was responsible for drastic changes in micro climatic conditions.According to Kajati (2021) mining has caused irreversible damage to agriculture in Goa as it caused large scale degradation of land in Goa. This includes land excavated to extract the ore, resulting in huge gaping pits and land used for dumping. Every year or around 30 million tons ofmining rejects were generated and stacked in large dumps.

Water Logging

Water logging converts the fertile land into wasteland in various ways such as submerged areas of reservoirs, the area along the canals, low laying areas etc. Thus, water logging on the one hand reduces the short-term economic returns and adds to wasteland on the other hand which creates the ecological and environmental disturbances. In Goa due to rapid urban development in last 10 years of so there are problems of water logging.

Salt Water Intrusions

Salt-water intrusions are mainly of two types, one being on the surface and other being underground especially in coastal areas. Due to improper management and ground water exploration the problem of salt water intrusions has already threatened our coastal areas which is indirectly leading to formation of wasteland and disturbances in geological conditions. The untreated industrial waste containing hazards chemicals etc. will directly affect the fertility of land encouraging the development of wasteland.

Silting and Erosion

Erosion of soil, its transportation by various agencies at deltas due to silting and deposition lead to the major problems of today is encroachment of seas

and the erosion of the soil or deposition of silt on it, in the plane areas directly reduces the fertility, resulting into the wasteland. Silting reduces the depth of rivers, which also leads to floods. The Zuari and Mandovi rivers are the burning examples of this class in the state of Goa in which large scale siltation occurs due to mining activities. About 50-60 years back there used to be good drinking water from wells close to sea cost (50-100 m). by year 2003 the saltwater intrusion had reached to about 300 m (Chachadi *et al.,* 2003) and its intrusion zone is increasing year by year.

Surface Runoff

Carriage of sands particles due to heavy wind in deserts is forming more and moreland in to its component part leading to wasteland. This is the major problem of Rajasthan, it is gathered that Rajasthan desert is spreading at a very fast rate towards the interior parts of the state and if no precautionary measures are taken it is expected to touch the Jaipur and Bikaner areas in the near further.

Mining

Large scale mining (legal as well as illegal) throughout the country is not only reducing the forest land cover and agricultural land but is also responsible for large environmental problems and climate change and is also adding to wasteland in terms of abandoned mines. Although in the last decade there is a control on such activities due to tough environmental laws and judicial interventions, but a lot has to be done for implementation of judicial judgements and National Green Tribunal (NGT) orders and also to check illegal mining and mafia. Goa is an example where large-scale mining has no doubt increased economics of state and its people but is responsible for wasteland addition.

Classification of Wasteland

There were various classifications of wastelands is use in literature However the National Remote Sensing Agency (NRSA) published the first wastelands atlas of India in year 2000. The map was produced at a scale of 1:50000 which also included boundaries of micro watersheds and offered district level estimates of the various types of wastelands in the country. This resulted in a scientific classification and reliable estimate of the wasteland in the country its monitoring and development on a scientific basis. Based on this the first formal Wasteland atlas of India was published in year 2003 and then second on in year 2019 by NRSAfor preparing the wasteland maps and published as wasteland atlas of India and is used in all official record and is presented in Table 1.

Table 1. Wasteland Classification

Sl No.	Category	Sub category (NRSA-2019)	Sub category (NRSA-2003)
1	Gullied and/ or ravinous	1 Medium 2 Deep	1 Shallow 2 Medium 3 Deep
2	Land with Scrub	3 Medium 4 Deep	4 Dense Scrub 5 Open Scrub
3	Waterlogged and Marshy land	5 Permanent 6 Seasonal	6 Permanent 7 Seasonal
4	Land affected by salinity/alkalinity	7 Medium 8 Strong	8 Strong 9 Medium 10 Slight
5	Shifting Cultivation	9 Current Jhum 10 Abandoned Jhum	11 Current Jhum 12 Abandoned Jhum
6	Under-utilised/degraded forest	11 Scrub Domin 12 Agriculture	13 Scrub Domin 14 Agriculture
7	Degraded pastures/ grazing land	13 Degraded pastures/ grazing land	15 Degraded pastures/ grazing land
8	Degraded land under plantation crop	14 Degraded land under plantation crop	16 Degraded land under plantation crop
9	Sand	15 Riverine	17 Sands-Flood Plain
		16 Coastal	18 Sands-Levees
		17 Desertic	19 Sands-Coastal
		18 Semi Stab. -Stab>40m	20 Sands-Semi Stab. -Stab>40m
		19.Semi Stab. -Stab 15-40m	21 Sands-Semi Stab. -Stab 15-40m
		22 Sands-Semi Stab. -Stab <15m	
		23 Sands-closely spaced Inter-dune area	
10	Mining Wastelands	20 Mining Wastelands	24 Mining Wastelands
11	Industrial wastelands	21 Industrial wastelands	25 Industrial wastelands
12	Barren Rocky/Stony waste	22 Barren Rocky/Stony waste	26 Barren Rocky/Stony waste
13	Steep sloping area	…..	27 Steep sloping area
14	Snow covered /Glacial area	23 Snow covered /Glacial area	28 Snow covered /Glacial area

It can be seen from the above Table while as per NRSA (2003) wastelands are classified in 14 main categories with total of 28 sub-categories, in its revised edition NRSA (2019) presently in use it has 13 categories and 23 sub-categories. A close look at the Table 1 indicates that category of steep sloping area is dropped in 2019 revision. Further under category 1 "Gullied and/ or ravinous" sub-categories are reduced to 2 from 3. Similarly, under category 9 "sand" sub-categories are reduced to 5 from 7.

The NRSA (2019) also states the classes of non-wasteland area in to 9 categories namely built-up area, industrial area, crop land, fallow land, plantation, forest-dense/open, forest plantation, grass land and water bodies.

Reclamation of Wasteland

Revive Social Forestry

Social forestry being the failure by the NWDB can be effectively made successful even in private wasteland if they are supplied seedlings of good economic return. Through Research & Development, the Indian Council for Agricultural Research (ICAR) should recommend the possible varieties of seedlings based on wasteland soil conditions, climate and the environmental considerations.

Public Participation

General awareness should be created among the public in reclaiming in the public wasteland. Public should be involved in the wasteland reclamation projects intensively. Neither planting alone nor slogans will recover the wastelands in reality; no doubt it can be reclaimed only on papers. Practical reclamation of wasteland is possible only by protection and intensive care by the public and the government. For active participation of the public in reclaiming public wasteland following programmes recommended, and can be used at first instance at least on experimental basis. Joint ownership of reclaimed wasteland between the government and the beneficiary may help utilising the wasteland properly. Under the scheme the beneficiary will enjoy the economic outputs while land remains the property of the government. To avoid the misuse of the scheme the given land should be declared as non-transferable and non-convertible.

Reclamation of Urban Area Wasteland

In urban zones the waterlogged areas and garbage disposal sites are considered to bethe wasteland. These wastelands may be recovered through special programmes involving the soil engineers and the environmentalists. Through the initial investments for reclamation may be large, once it is reclaimed the returns will be also high with respect to initial investment made for the reclamation. To avoid covering more area by garbage and its ill effects on health of the public staying nearby areas a garbage disposal plant should be installed. An effective garbage collection and transportation system is also essential.

Preventive Measures

"Prevention is better than cure" – it is more applicable here too. As deforestation is the major cause and which leads to formation of wasteland on many ways it can be countered by developing the alternatives for wood (for example renewable sources of energy, development of plastics and other synthetic materials in place of wood). For protection of forests, the existing legal coverage should be revised as per necessity and strict action should be taken against the defaulters. Such laws and regulations should include clauses governing ecological and environmental balance. These laws and regulations should be equally and strictly followed by government agencies also. The precautionary measures for deforestation if successful will also reduce soil erosion and silting. A good amount of fertile land is unused and thus it is wasteland because of various legal and other difficulties such difficulties should be solved at top priority. An Example of this class is "comunidade land" is the state of Goa. Therefore, land reforms are required for this purpose.

Awareness programme should be launched in public so that public co-operation can be obtained fully in preventive measures. Effective water management is required to avoid wasteland formation due the salt-waterintrusions. Groundwater recharge and management should be practised to counter the same effectively. Canals and other waterways should be in line so that on one hand formation of wasteland in surrounding area is prevented and on the other hand percolation losses are also reduced. Maintaining the green belt around the desert will help to control the surface run off, i.e. its expansion and extension. Scientific agriculture and balanced use of fertiliser will also help to prevent formation of wastelands.

Wasteland Development Initiatives at Country Level

as per the 'Wastelands Atlas' (2019) Approximately till year 2015-16; 55.76 Mhais wasteland. This is about 16.96% of the country's geographical area). In 2008-09 it was about 56.60 Mha (17.21%) in 2008-09. Thus, in a period of 7 years only 0.84 Mha of wasteland area could be recovered which is a very dismal. Out of this wasteland area about 50% of the wastelands can turn fertile if treated properly.

In view of the abatement of wasteland the National Wastel and Development Board (NWDB) was formed for the reclamation of wasteland. NWDB used social forestry as the only method of reclamation. The analysis of progress shows that the NWD B experiment has been a failure. Although it claims to have placed 5 million hectares under plantation in 1985-88 this figure as reported needs to be heavily discounted since it is not based on the actual measurements but has been derived by the number of seedlings used by factor of 2 thousand. Since 50 % of

Table 2. Wasteland Estimates for Goa State

Sl. No.	Category and Sub-Categories	Estimate of wasteland (Square Kilometre) Year				% Change from 2003 to 2016
		2003	2006	2009	2016	
1	Gullied and/ or ravenous					
	1 Shallow	0.00	….	…	…	
	2 Medium	0.00	0.00	0.00	0.00	
	3 Deep	0.00	0.00	0.00	0.00	
2	Land with Scrub					
	4 Dense Scrub	39.88	51.89	82.14	97.58	+144.68
	5 Open Scrub	230.54	216.38	264.78	249.55	+8.24
3	Waterlogged and Marshy land	41.55	42.79	25.46	25.46	-38.73
	6 Permanent 7 Seasonal	10.83	9.48	13.98	14.58	
4	Land affected by salinity/alkalinity	0.00				
	8 Strong	0.00	0.00	0.00	0.00	
	9 Medium	0.00	0.00	0.00	…	
	10 Slight					
5	Shifting Cultivation					
	11 Current Jhum	0.00	0.00	0.00	0.00	
	12 Abandoned Jhum	0.00	0.00	0.00	0.00	
6	Under-utilised/degraded forest					
	13 Scrub Domin	52.01	57.78	63.87	63.59	+22.26
	14 Agriculture	1.01	3.24	6.34	6.34	+527.72
7	15 Degraded pastures/grazing land	0.00	0.00	0.00	0.00	
8	16 Degraded land under plantation crop	33.42	14.69	0.50	0.50	-98.50
9	Sand 17 Flood Plain/Riverine					
	18 Levees					
	19 Coastal					
	20 Semi Stab. -Stab>40m					
	21 Semi Stab. -Stab 15-40m					
	22 Semi Stab. -Stab <15m					
	23 closely spaced Inter-dune area					
10	24 Mining Wastelands	50.49	30.95	33.05	33.62	-33.41
11	25 Industrial wastelands	0.00	0.35	0.39	0.39	?
12	26 Barren Rocky/Stony waste	58.41	64.33	17.71	17.71	-69.68
13	27 Steep sloping area	4.94	0.00	0.00	0.00	?
14	28 Snow covered/Glacial area	0.00	0.00	0.00	0.00	
15	Total Area	531.29	496.27	514.55	515.66	-2.94
16	Percentage of Total Geographical Area	14.35%	13.41%	13.90%	13.93	…..

the seedlings were distributed among farmers for the plantain on private lands, the area of public wasteland which could have been planted by the remaining 50% seedlings cannot be possibly be more than 2.5 million hectares. Considering that faulty implementation, assessment and protection, the wasteland area likely to be effectively reclaimed during 1985-88cannot exceed 1.5 million hectares. This corresponds to an annual rate of 0.5 million hectares which is just 10% of the target laid down by NWDB.

In the year 1995 NWDP was re-organised and was incorporated under Ministry of Rural Development's newly Department of waste land development.

Another initiative was formation of Integrated Wastelands Development Programme (IWDP) in April-1995 and launching of scheme "HARIYALI". The scheme was further revised in August-2001. To further simplify procedures and involve the Panchayat Raj Institutions PRIS, more meaningfully in planning,implementation and management of economic development activities in rural areas, the Guidelines for Hariyali were introduced in April-2003. The scheme is handled by theDepartment of Land Resources, Ministry of Rural Development, Government of India.In addition, there are various initiatives of various Govt. departments and organisation which also help and contribute in management and development of wasteland. Some them are The Integrated Watershed Management Programme (IWMP) Watershed Development project in Shifting Cultivation Areas (WDPSCA) Accelerated Irrigation Benefits Programme (AIBP).

NABARD financed schemes Rural Infrastructure Development Fund (RIDF)

E. Other Government of India Schemes

Soil Conservation schemes by ministry of Agriculture

Rastriya Krishi Vigyan Yojna (RKVY)

Prime Minister Krishi Sinchayee Yojana (Watershed Development Component) (WDC-PMKSY

According to Chadha (1996) nearly 15.00 million hectares was still lying as the culturable wasteland in 1990-91.; which constituted a 5.0 % total reported area and as much as 10.5 per cent of net sown area and it was clear that on such area most attention must be fixed in wasteland development for augmenting agricultural land mass is to succeed.

According to a LBSNAA (2010) report on impact and effectiveness of watershed development programme (WDP) it has stressed upon improvement in wasteland and there was considerable impact in reduction of wasteland due to WDP. For example, in Himachal Pradesh there was decrease in cultivable wastelands due to WDP in the state. On an average about 60% of the cultivable wastelands especially that are nearby the newly developed irrigation structures are put into use i.e. cultivation started in these wastelands due to WDPs.

According to a report of Indian Council for Agriculture (ICAR) prepared in collaboration with National Academy of Agricultural Science (NAAS)in year 2010; the earliest assessment of the area affected by the land degradation wasmade by the National Commission on Agriculture at 148 M ha, followed by 175M ha by the Ministry of Agriculture (Soil and Water Conservation Division).The NBSS&LUP estimates projected an area of 187 M ha as degraded lands in1994 and revised it to 147 Mha in 2004. The National Wasteland Development Board estimated an area of123 M ha under wastelands.

Wasteland Development Initiatives and Status in State of Goa

The tiny and beautiful coastal and 25th state of India that is State of Goa has total geographical area of about 3702 sqm. According report on 10th Agricultural Census 2015-16 total total agricultural are in Goa is 82085 hectares. Out of this area 80793 hectares or 98.00 % were net sown area and 827 hectares or 1.01 % was current fallow. Thus, the net cultivated area formed 99.43 % of the total operational area in the State. The share of the uncultivated Area accounted for 0.57 %.Table 2 presents the various categories and sub-cateories of estimated wasteland in the state of Goa.

The data given in Table 2 indicates that from year 2003 to 2016 there is no considerable change in recovery in wasteland. It almost remains same as a whole being 14.35%, 13.41%, 13.90% and 13.93% in year 2003, 2006, 2009 and 2016 respectively.

Further there is no wasteland under categories 1 Gullied and/ or ravenousland, category 4 Land affected by salinity/alkalinity, category5 Shifting Cultivation and category 14 Snow covered /Glacial.It is little surprising that Goa being a coastal state with 105 km coast line and with width of about 35 km has not affected by salinity/alkalinity. Further wasteland under category 13 that is steep sloping area in 2003 it was reported that 4.94 sqm was under it

which becomes 0.00 from 2006 onwards.

Conclusion

This paper presents some important aspects of waste land status and way forward. Today wasteland formation is the great threat to our economy, ecology, health and environment and also detrimental to economic and social fabric of the country. Hence an effective wasteland development and management is the need of the hour as we are talking about 5 Trillian economy and demography boom. The major conclusions of the study are presented below.

(i) Technology is certainly playing in mapping the wasteland effectively. It is also playing dominant role in its development and management. However, there are various bottlenecks that need to be addressed.

(ii) The watershed development initiatives are showing the positive results in reclaiming the wasteland. However, there is a need for more inclusive social participation in it. Effective and balanced water management is required.

(iii) The deforestation (particularly due to mining activities) is the major cause for the formation of wasteland and need to be yet addressed effectively. Social forestry as employed by NWDB is a failure in its present form and requires modifications. Only planting, distribution of seedlings and slogans will not reclaim the wasteland. Protection of plants is of utmost importance. Public awareness and people's participation are essential in wasteland reclamation.

(iv) As far as state of Goa is concerned the published data indicate that thee is no serious efforts as evident from outcome as the wasteland which was about 14.35% of total geographical area in year 2003 remained at 13.93% in year 2016. We have to wait for next wasteland mapping data and see if serious efforts as claimed by Government departments involved have yielded any positive results from year 2016 onwards.

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