

Financing Green Infrastructure in States

Case Studies



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1. Introduction

Strategic use of public finance and mobilisation of private capital for green finance is critical to meet sustainable infrastructure requirements. States in India have taken various steps towards climate action. These meaningful efforts need to be aligned towards the common endeavour of creating sustainable infrastructure. In order to do that, there is a need to cross pollinate respective good practices and place them in the larger context of mobilisation of finance.

With this objective in mind, this report looks at states of Rajasthan, Maharashtra and Odisha. For Rajasthan, a roadmap is developed for the short term. Action on this roadmap will help align State Climate Action Plan with strategic use of public finance, green tagging in the budget, interdepartmental coordination, transition management and institutional calibration. From Maharashtra and Odisha good practices have been incorporated on borrowings through SDL and key fiscal tools respectively.

2. Case Studies

2.1. Rajasthan

Rajasthan is not only the largest state in India, but also one amongst those with unparalleled potential, high climate sensitivity but very limited fiscal space. This roadmap therefore entails a holistic view which includes climate profile of Rajasthan, Fiscal Headroom for the State, suggestions for Interdepartmental Coordination, Short-term to Medium Term Green Budget Framework, list of potential assets and Institutional Mechanism required for a robust and concerted strategy for climate action and sustainable development.

2.1.1. Climate Profile – An Overview of Vulnerabilities and Gaps

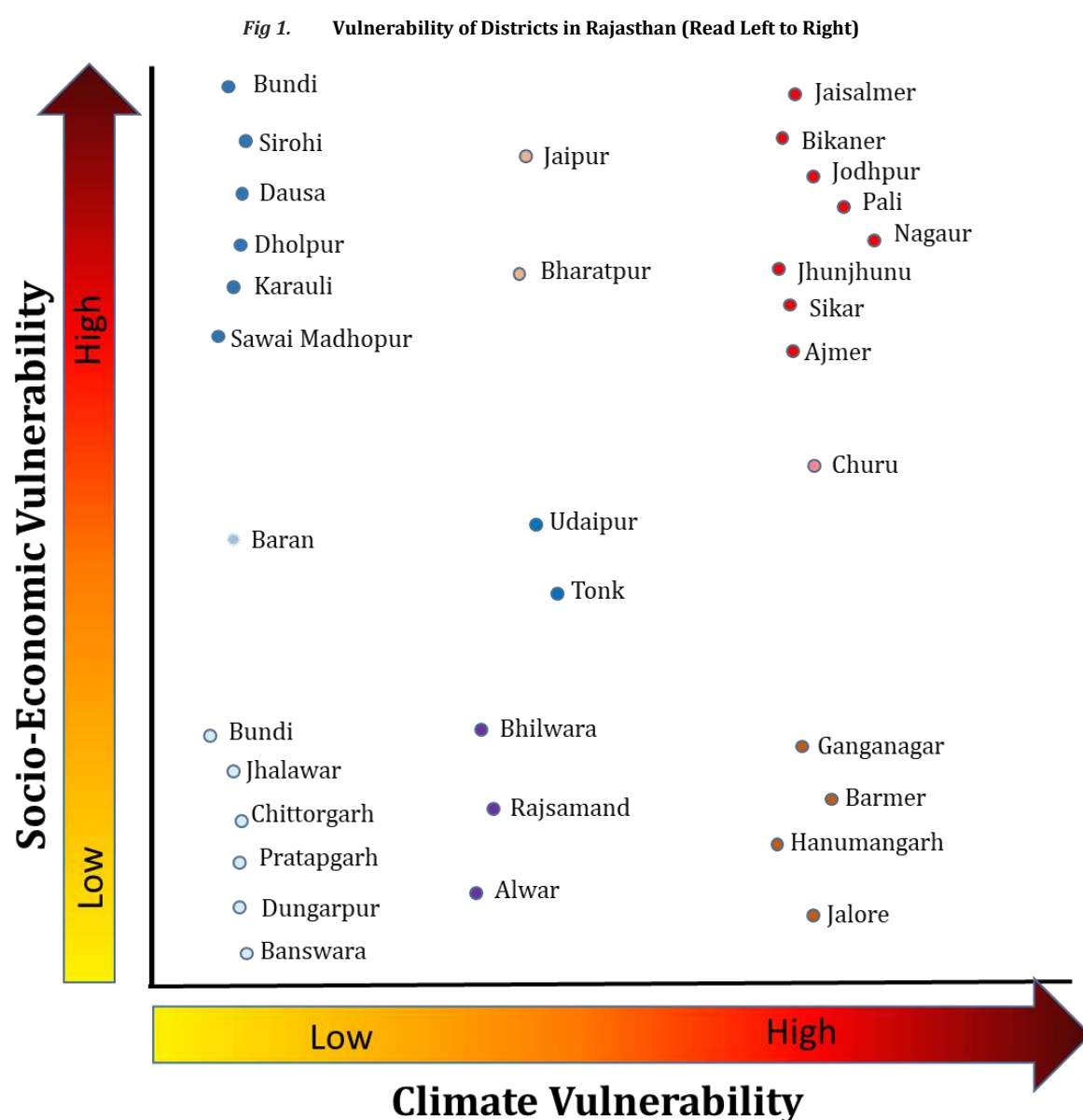
In 2008, the National Action Plan on Climate Change (NAPCC) was instituted to address the challenges posed by climate change in India. Since then, various states across India have developed their state action plans and have used them to align state strategies on Climate Action. In that sense, state climate action plans have come to serve as the base document upon which climate aligned state strategies are built.

The latest comprehensive Rajasthan State Action Plan on Climate Change (RSAPCC) was released in 2022 by the Department of Forest, Environment and Climate Change, Government of Rajasthan. The plan addresses district wise climate vulnerabilities, risks, impacts and opportunities that are specific to the State of Rajasthan and therefore it is in order to capture its essence to contextualize this section from the perspective of climate change. **(Fig. 1.)**

Rajasthan has very high climate sensitivity compared to other states in India and is prone to extreme events such as erratic rainfall with frequent dry spells, occasional heavy downpours, and extreme seasonal temperatures, sandstorms, droughts, famines and floods. The fact that over two-third of the population depends on climate sensitive sectors such as agriculture,

animal husbandry and forestry, it is all the more important to plan infrastructure in accordance with vulnerabilities of the state.

The risk analysis at the State and the local level shows that groundwater levels in the north-eastern districts of Rajasthan have a high decreasing trend in terms of magnitude, which implies rapid groundwater depletion. Rajasthan is also characterized by arid and semi-arid regions and is therefore already highly susceptible to droughts. Patterns suggest an increase in drought months for several areas across Rajasthan. Even though analysis suggests increase in the water availability in the south-eastern part of Rajasthan in the future, overall water scarcity can be a problem where the effects of reduced rainfall and overexploitation of ground water are likely to compound the problem in the future. Apart from high climate sensitivity and vulnerability, Rajasthan also has the lowest adaptive capacity of all states owing to its geographical attributes at an aggregate level. District-wise vulnerability may however vary.



Source: Rajasthan Climate Action Plan, 2022 (Representation: Author)

This necessitates a comprehensive outlook towards adaptation and mitigation strategies in the state. The plan highlights several infrastructure requirements across key areas and emphasizes the need for decentralized planning such as the one undertaken in Kota city. To elaborate Kota city has undertaken extensive documentation of the vulnerabilities due to climate change. This includes detailed studies on solid waste management, water supply, toilet facilities, sewerage, storm water drain connectivity and flood risks. Risk assessments and infrastructure readiness are conducted at the ward level by paying special attention to vulnerable hot spots and social groups. However, similar comprehensive assessments and evaluations are not available for other cities, towns, and panchayats in the state even though sector-specific strategies have been developed for certain cities such as the Comprehensive Mobility Plan for the city of Jaipur and Jodhpur.

With respect to broad infrastructure requirements, the plan highlights the need for rainwater harvesting including in building designs, recharge of underground aquifers through artificial recharge methods, creation of green areas in urban regions through the use of paving materials that facilitate groundwater infiltration, centralization of groundwater extraction to ensure judicious and regulated distribution of groundwater resources, using more efficient methods of irrigation, reducing the area under water-intensive crops, changing farming practices to sustainable agriculture (organic), carbon sequestration from forestry and agroforestry, and aligning overall infrastructure with climate requirements.

Since, most of these practices would span across urban and rural areas, they need to be explicitly included in policy mandates. Interestingly, the Rajasthan Urban Development Policy is sensitive to issues of disaster management and sustainability as is the Rajasthan Urban Housing and Habitat Policy of 2017. However, unlike, the Rajasthan State Highway Investment Program (2019) which entails an evidence-based assessment of the vulnerability of roads and highways to climate change, most of the policies and strategies are silent about climate aligned goals or tend to be generic at best. Evidence of this fact is that very few local government bodies directly include climate in their agendas or plans. A few master plans do mention solar panels, afforestation, water conservation, indigenous knowledge, green zones, etc., but they also do not comprehensively recognize and address climate risks.

There are also issues pertaining to definition of concepts and strategies for Green and Sustainable infrastructure which affects systematic green and sustainable infrastructure development.

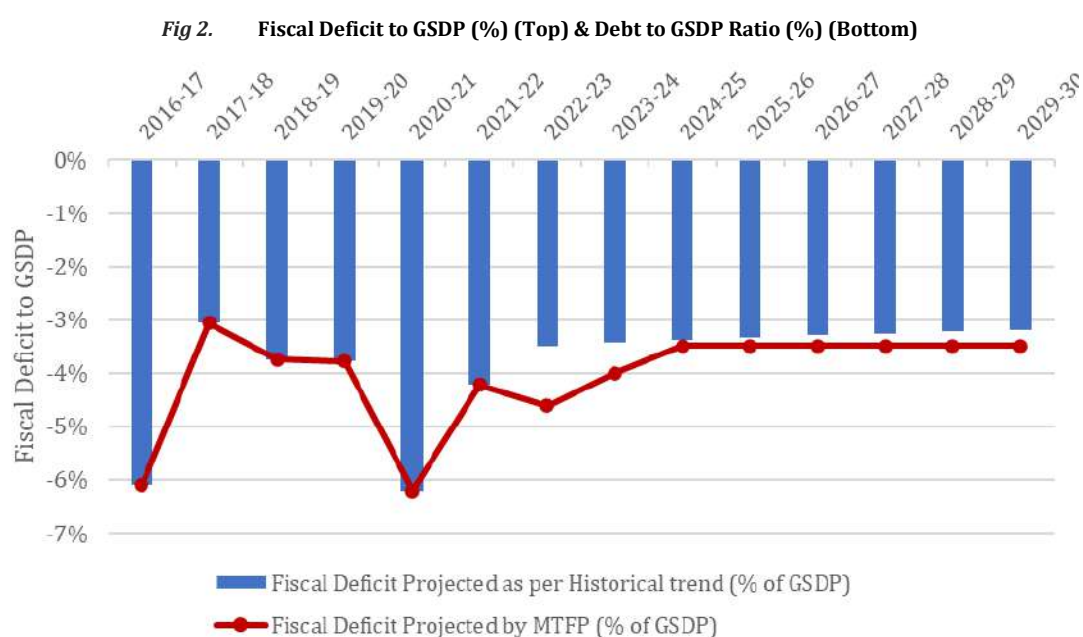
The plan also examines the emission profiles of eight sectors namely thermal power generation, industrial manufacturing, brick production, transportation, residential, agriculture, waste management, and tourism. Power is one of the highest CO₂ emitters in India, however, in Rajasthan, sectors like industrial production, agriculture and tourism are equally important. In 2019-20 (the base year), the highest CO₂-eq. emissions came from power generation (40 MT CO₂-eq./y) and the agricultural sector (40 MT CO₂-eq./y), followed by industrial production (27 MT/year), transport (10 MT CO₂-eq./y) and the residential (10 MT/year) sectors.

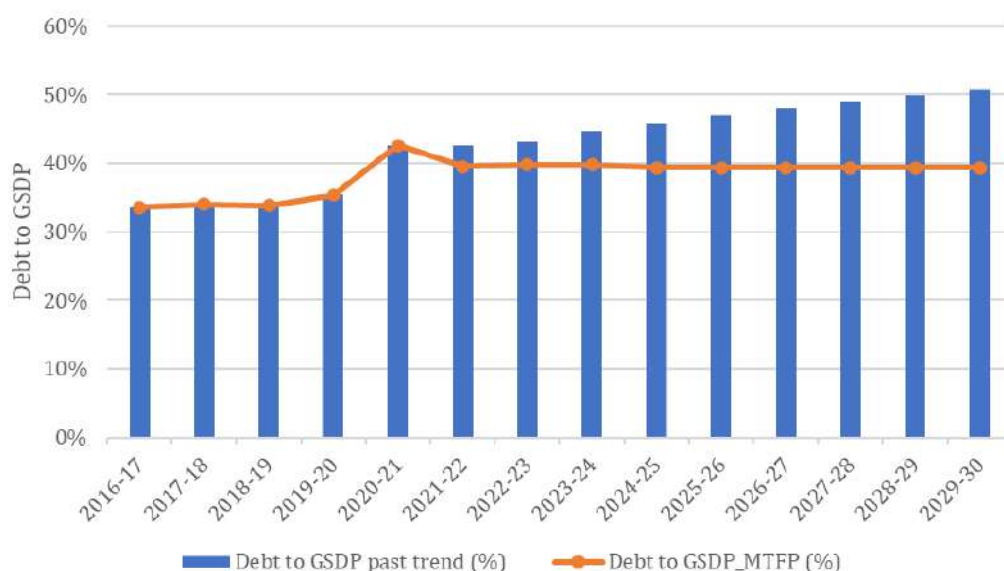
In the future, Rajasthan is estimated to contribute a total of 137 MT CO₂-eq./y with significantly increasing trends. By 2030, emissions from brick manufacturing are expected to more than double with the present technology mix; in the transport sector, they will increase by 2.7 times; in the residential sector, it is likely to grow by 20%; and in the agricultural sector, it will increase by 18%. Overall, emissions are expected to increase by approximately 1.7 times the present value in 2030 under the Business-As-Usual Scenario. This necessitates concerted action on adaptation as well as mitigation strategies.

These facts necessitate an equal and balanced focus on both – mitigation as well as adaptation.

2.1.2. Understanding resource availability for Sustainable Infrastructure in Rajasthan

With respect to understanding the fiscal headroom available with the state, two kinds of estimates can provide substantive insights. The first is the estimates of Fiscal Deficit (as a percentage of GSDP) which looks at significant reduction based on historical trends (**Figure 2 (Top)**). MTFP projections are available until 2026-27 and in order to understand the fiscal headroom until 2030, the same trend has been extrapolated. The revenue collection projections built into the MTFP provide some fiscal headroom. However, the state seems to have limited space via public finance and therefore aggressive strategies for revenue collection and innovative mechanisms to finance green infrastructure will need to be deployed. On the other hand, Debt (as a percentage of GSDP) in the business-as-usual scenario (historical trends) shows a rising trend. Hence, there is a need to consolidate the state's debt in the long-term horizon in order to fulfil the FRBM mandate (**Figure 2 (Bottom)**). This necessitates adoption of innovative financial mechanisms to attain the fiscal glide path.

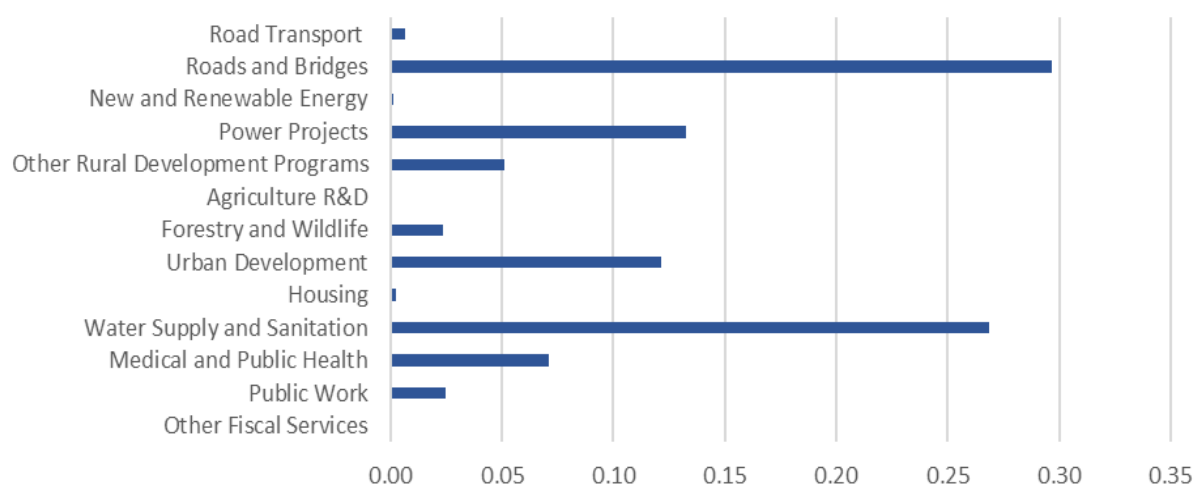




Prepared by Author

Rajasthan currently does not have any dedicated green budget, however, it is also likely that some part of the infrastructure might already been ‘Green’ as per recognized taxonomies but might not have been classified as such. A snap view of past (actuals) budgetary expenditure (see Figure) in key infrastructure areas provides an idea of the opportunity that lies ahead.

Fig 3. Allocation of Capital Outlay in key infrastructure areas (2017-24)



2.1.3. Need for Interdepartmental Coordination

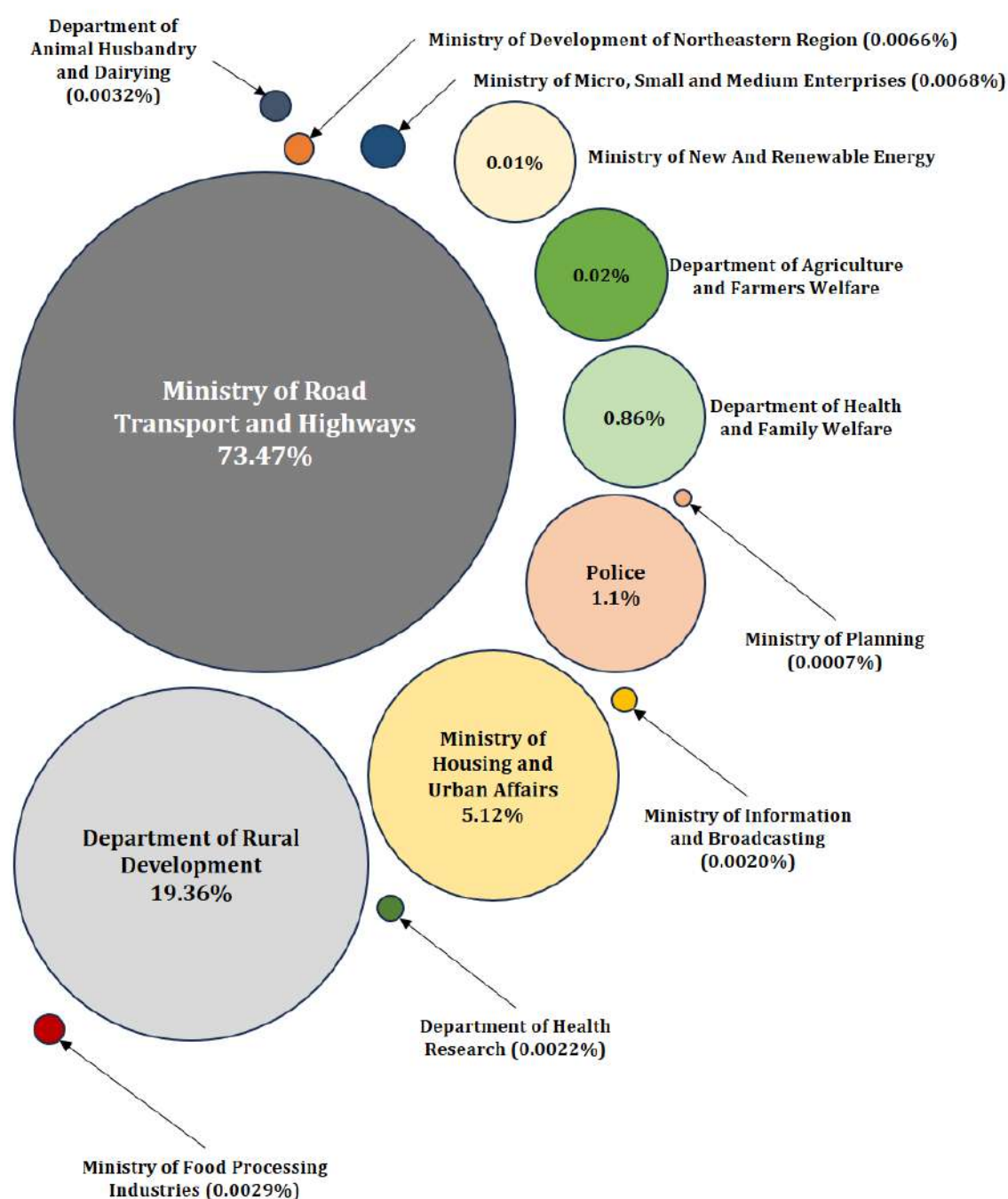
An important aspect from allocation and monitoring perspective would be programmatic budgeting, broadly structured on two verticals – Adaptation and Mitigation. This shall enable tracking of inter-departmental coordination across sub-themes in each category.

A recent study by National Institute for Public Finance and Policy (NIPFP) titled ‘G20 and Climate Responsive Budgeting’ exhibits such departmental inter-linkages at the Union-level. In the context of adaptation related expenditure, the study found that allocation of more than forty

sectoral ministries in this regard account for around 5 per cent of GDP in India. Similar exercises must be carried out at the at the state level.

Related to multi-departmental coordination, an important and perhaps a more complex exercise is to quantify benefits that are accrued across the value chain and across departments. If such benefits can be accounted for in a separate manner, they can potentially be used for transition support, debt servicing or bringing the cost of capital down. This will help to calibrate a fiscal glide path (**Fig. 4.**)

Fig 4. Total Capital Expenditure allocations on Infrastructure for adaptation (RE 2022-23) at the Union-level



As per a CEEW study, in the case of Rajasthan natural farming practices like adding cover crops, intercropping, and application of bio-stimulants could improve the soil health and its water retention capacity and encourage water infiltration, in turn reducing irrigation water requirement by up to 60 per cent. This will improve the farm resilience in water-scarce regions.

Moreover, merely 20 per cent of the state's farmers adopting natural farming could save the government's annual power subsidy outlay by INR 7.81 billion. Further, the reduced or no chemical input under natural farming could save cultivation costs by up to 60 per cent for crops such as wheat. The cost savings can potentially improve farm incomes by 30-40 per cent, likely to reduce the farmers' indebtedness. Improving farm incomes can help reduce the state's outlay on debt-waivers, which amounted up to INR 75.50 billion during 2018-20, and fertilizer subsidies (around INR 79 billion as of 2021-22 for Rajasthan).

On similar lines, a policy innovation has been brought out under the PM Programme for Restoration, Awareness Generation, Nourishment, and Amelioration of Mother-Earth (PM-PRANAM) scheme at the Union-level which aims to support the mass movement started by States/UTs to prevent further degradation of natural resources by promoting sustainable and balanced use of fertilizers, adopting alternate fertilizers, promoting organic farming and implementing resource conservation technologies.

Under the scheme, 50% of the fertiliser subsidy saved by a State/UT in a particular financial year by way of a reduction in consumption of chemical fertilisers (Urea, DAP, NPK, MOP) compared to the previous 3 years' average consumption, will be passed on to that State/UT as Grant.

The scheme has no separate budget and is financed through the savings of existing fertiliser subsidy under schemes run by the Department of Fertilizers. A similar exercise can be undertaken for energy savings and water conservation, amongst others at the state level.

Pertinent to mention here is that the Framework for Sovereign Green Bonds by the Government of India has already created a replicable template for state action. This is illustrated in the **Table 1** below:

Table 1. **Examples of potential Impact Reporting Metrics**

Green Bond Category	Examples of potential metrics
Renewable Energy	<ul style="list-style-type: none"> • Installed renewable energy capacity (in MW). • Annual renewable energy generation (in MWh). • Annual GHG emissions avoided in tons of CO₂e Social Co-Benefits (wherever possible to quantify) <ul style="list-style-type: none"> • Number of households benefitted • Number of under-privileged households benefitted • Number of jobs created

Energy Efficiency	<ul style="list-style-type: none"> • Number of energy efficiency equipment and appliances installed • Annual energy savings (in MWh). • Annual GHG emissions avoided in tons of CO₂ emission
Sustainable management of natural resources	<ul style="list-style-type: none"> • Area of land or ocean conserved/recovered (km²). • Area (km²) of marine/forest reserves under active monitoring.
Clean transportation	<ul style="list-style-type: none"> • Number of people who use new ecological public transport • Number of km of new electric train/road lines created/maintained • Annual GHG emissions avoided in tons of CO₂ emission. • Air Quality improvement (PPM) <p>Social co-benefits (wherever possible to quantify)</p> <ul style="list-style-type: none"> • Employment generated – number of jobs created/supported • Number of MSMEs supported • Number of people with access to sustainable public transport systems
Sustainable Water	<ul style="list-style-type: none"> • Volume of water collected and/or treated (m³) • Increased water efficiency of systems (% reduction in water consumption/loss) • Number of households that have access to new potable water supply
Green Building	<ul style="list-style-type: none"> • Level of certification by property • Annual energy savings (in MWh) • Annual GHG emissions avoided in tons of CO₂e

Source: Framework for Sovereign Green Bonds, Government of India

2.1.4. Need for a Green Budget – A Short-Term to Medium-Term Approach

Starting with the exercise of green tagging, in the short to medium term Rajasthan can comprehensively embark upon the process of ‘Green Budgeting’ (**Table 2**). Towards this endeavour, as a first step, it is recommended that Rajasthan sets up a dedicated body under the Public Finance Management (PFM) division under the Department of Finance to enable a smooth institutionalisation of ‘Green Budget’ process.

Such a body can be a mix comprising climate experts, former & current government officials from finance and environment departments, and taxonomy experts. Sectoral experts and regulators can be invited from time to time on a need basis. The key to its success will be a formal mandate by the state government. To begin with, some of the issues such a body can look into in the short term are as follows:

- A state-level climate action plan should serve as a base document to guide overall state strategy on mitigation, adaptation, sectoral development and investment. The

actionability of state climate action plan is therefore critical. Currently, district wise action strategies in the state climate action plan are generic in nature. This could be made more specific in accordance with vulnerabilities identified for each district under the plan. Ideally, project preparation at the district level should also incorporate the principles of disaster risk reduction and prevention.

- Additionally, the short term green budget exercise can incorporate the compliances sought by National Green Tribunal (such as National Capital Region plan on Transport), new policy announcements such as Rajasthan Hydrogen Policy, re-look at policies that may need better alignment with the market trends and Greening, for instance Rajasthan Electric Vehicle Policy (REVP) 2022 (**Annexure-III**) and alignment of state policies with Long Term- Low Emission Development Strategies (LT-LEDs) articulated by the union government to complement India's updated NDCs.
- Identification of relevant departments and their respective allocations towards green spending to enable understanding of overall expenditure towards its Green Infrastructure.
- A state level fiscal risk statement can serve as an overall guideline document to better plan fiscal management in the backdrop of climate imperatives. For instance, Odisha periodically comes out with such a document.^a Fiscal risk statement must also include risk management strategies such as creating fiscal buffers, ensuring budget flexibilities (for example, contingencies for natural disasters, provisioning), and using risk transfer instruments (for example, insurance)
- A medium-term fiscal policy (MTFP) statement needs to be adjusted in the backdrop of climate considerations. In other words, the fiscal trajectory specified in a MTFP should be consistent with debt sustainability analysis, which should cover the effects and risks related to climate. This would inform policymakers in the implementation of risk mitigation measures
- Climate tagging of infrastructure assets as per recognized taxonomies done by respective departments would come in handy and will not only help in Green budget formulation but also during the budget execution. An indicative list of assets that could be considered for Green Financing in Rajasthan in the short term as described in (**Annexure 1**)
- For the ease of tracking, program-based budgeting frameworks can be incorporated
- Control and audit mechanisms should be used to examine, measure, and monitor the efficiency and effectiveness of the Green budget

^a Finance Department, Government of Odisha. "Fiscal Risk Statement." Last modified July 2022.

Table 2. High Level Framework for Green Budgeting in the Short to Medium Term

Planning and Fiscal Framework	Preparation of Budget	Execution of Budget	Audit
<p>Requirements</p> <p>Revision of Climate Action Plan to incorporate more specific action strategies in accordance with vulnerabilities highlighted under the plan</p> <p>Set up a committee of experts in Public Finance Management Division of the Finance Department</p> <p>Fiscal Risk Analysis</p> <p>Assessment of Cost of Transition</p>	<p>Requirements</p> <p>Identification of sectors based on planning approach</p> <p>Mapping of relevant schemes and policies (For this purpose, alignment with updated NDCs and LT-LEDS with state action can be a starting point)</p> <p>Identification of expenditure allocation by all relevant departments towards specific mitigation and adaptation requirement and transition management</p> <p>Applying recognized green taxonomy for Green tagging</p>	<p>Requirements</p> <p>Tracking of green expenditure through chart of accounts to include a green or climate coding</p> <p>Financial management information system with adequate functionality for accounting and reporting of climate-related expenditure</p> <p>Should enable direct comparison between estimates and actuals</p>	<p>Requirements</p> <p>By Department of Finance, Line Ministries and External Audit</p> <p>Note: External auditors need to improve their own capacities to audit green budgets effectively</p>

Source: Representation by Author

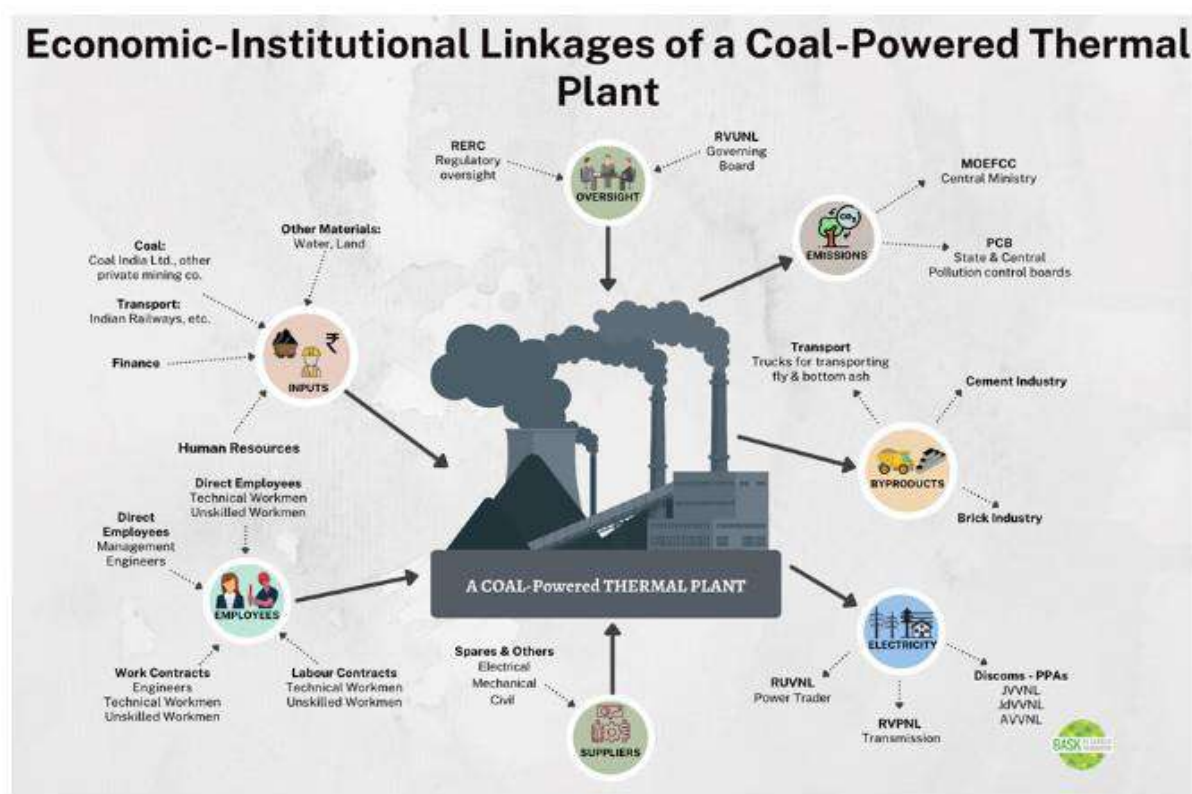
The actionability of Green Budget in the short-term can be ensured by concomitant focus on three aspects, namely, alignment of policies in Rajasthan with LT-LEDS and defining corresponding infrastructure targets, identification of potential green assets and lastly, identification of departmental budgets allocated for achieving a defined climate goal.

With respect to the above, an exercise of mapping current policies relevant for green transition in Rajasthan with LT-LEDS needs to be done along with mapping of corresponding infrastructure projects that a particular policy engenders.

2.1.5. Typology of State PSU Transition – A Case Study of Thermal Power Plant in Rajasthan

Since PSUs have a significant role to play in provision of core infrastructure, utility transition strategy needs an urgent consideration. For instance, in case of repurposing of Kota Super Thermal Power Station (KSTPS), which is under operation for 39 years, functioning beyond its operational life of 25 years, the impact needs to be measured across several aspects. **Fig.5.** shows the backward and forward linkages of KSTPS as an illustration of the scope and scale of the impact of repurposing of a thermal power plant (TPP) on the associated economy and human settlements.

Fig 5. Backward & Forward Institutional Linkages of a Coal-Powered TPP



Source: Representation by Centre for Energy, Environment and People (CEEP)

To address such complexities, in May 2022, the Union Ministry of Power urged all State Governments and Union Territory Administrations to set up State Level/UT-level Steering Committees for Energy Transition.^b The Steering Committees would work under the chairmanship of the Chief Secretaries of the respective States/Union Territories, along with relevant departments (Fig.6.) It was emphasised that States/UTs have a vital role in meeting state-specific goals on sustainable development in the most energy-efficient way.

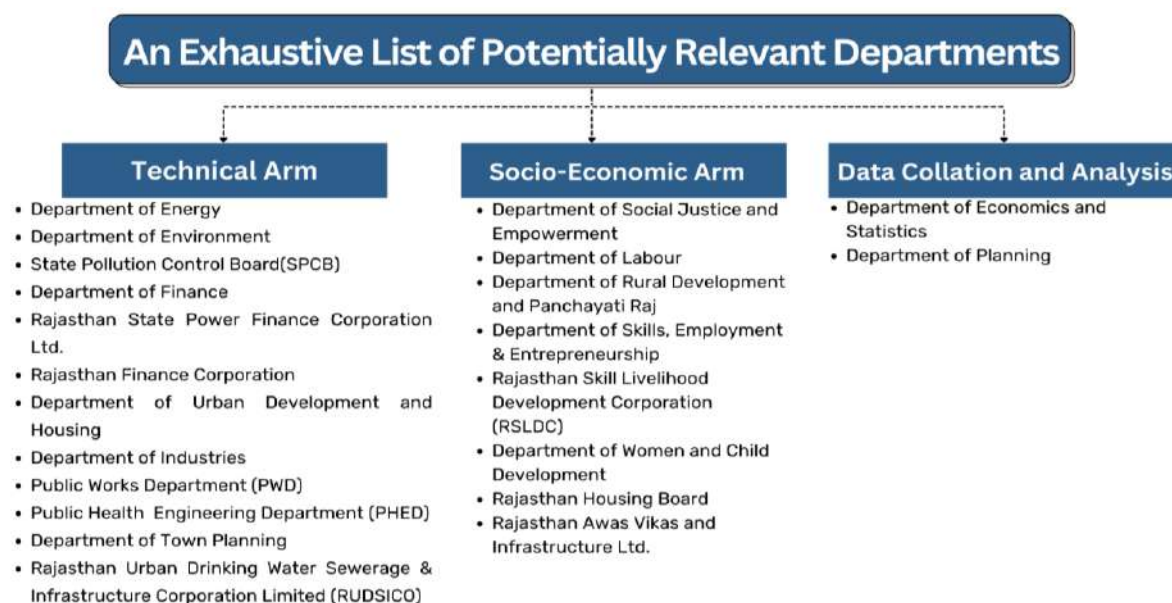
Fig 6. An Illustrative Composition of the State-Level Steering Committee for Energy Transition, as Proposed by the Ministry of Power, Government of India



^b State Level Steering Committees for Energy Transition <https://www.pib.gov.in/PressReleasePage.aspx?PRID=1828191>

Rajasthan has yet to setup such a committee. On a closer look, we assess that a few other departments should be included as a part of such a committee in order to facilitate inter-departmental coordination for repurposing and transition management. An indicative list of relevant departments is provided in **Fig.7**.

Fig 7. An Exhaustive List of potentially relevant Departments whose coordinated action is essential for addressing the challenges and leveraging the opportunities



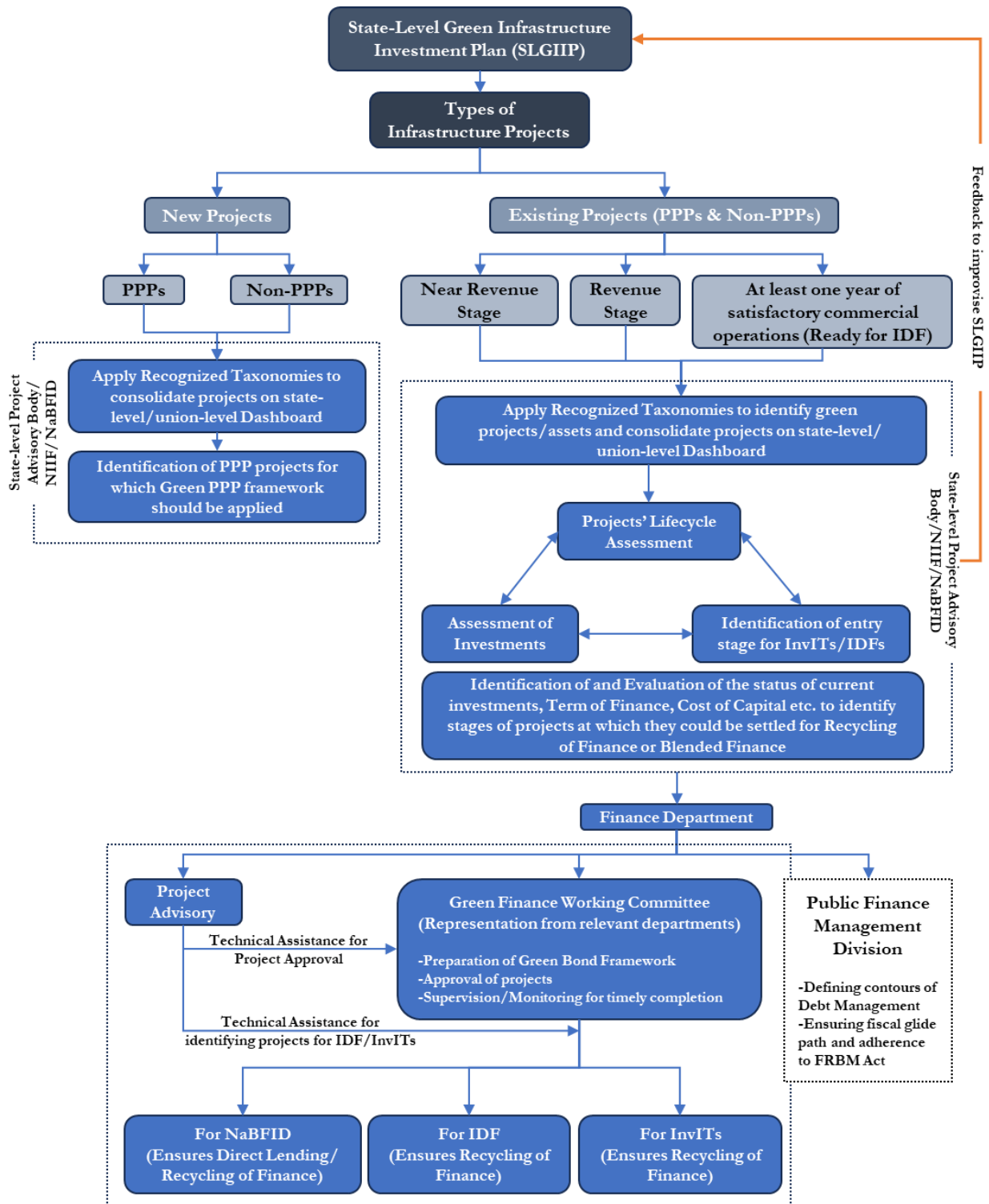
In order to address the costs entailed in the transition process, a transition fund may need to be set up as a part of the fiscal management strategy. From the typology of KSTPS, it is evident that a substantive impact would be on human settlements and possible rehabilitation.

Similar problems have been dealt at policy level for various other causes such as coastal erosion, disaster management, among others. For instance, the XV Finance Commission advocates compensation as well as rehabilitation of settlements in case of communities affected by coastal erosion. The State Level/UT-level Steering Committees for Energy Transition may take a leaf out of it. Additionally, targeted and bundled package of central and state schemes may also be considered from cost optimisation point of view.

2.1.6. Institutional Framework to Attract Private Capital for Green Infrastructure Financing

To systematically operationalize the use of above strategies, Rajasthan may commence an immediate process of putting together a State Level Green Infrastructure Investment Plan (**Fig. 8.**). The contours of the plan can be sketched out and implemented immediately through a top down and bottom-up approach deployed simultaneously.

Fig 8. Institutional Framework to Attract Private Capital (at scale) for Green Infrastructure in Rajasthan



Source: Representation by Author

For this purpose, as a first step the state may task PDCOR Ltd., a certified Company jointly promoted by the Government of Rajasthan (GoR) and Infrastructure Leasing & Financial Services Limited (IL&FS) to facilitate private sector investment in the infrastructure sector in the State of Rajasthan, as an exclusive agency to provide consulting and advisory support to the government on identification and implementation of Green Infrastructure. Necessary changes in

PDCOR's mandate may need to be carried out for the same. Alternatively, states can engage NIIF or NaBFID through their project consulting mandate to facilitate private sector investment in green infrastructure. A state dashboard with details of green assets and projects would be helpful to identify existing projects and the project pipeline within the state.

To ensure this, PDCOR Ltd. itself would need to be capacitated in Green Taxonomy as well as Green Bond Framework. Such trainings should be for dedicated PDCOR staff as well as technical officers from relevant departments. The frequency of the training should be half-yearly for the first two years. As deeper understanding and familiarity with technical concepts and their applicability is developed, the refresher training could be held annually.

Simultaneously, PDCOR Ltd., assisted by departments, should carry out an exhaustive stock taking of all infrastructure projects. These could be divided into two categories – new projects as well as existing projects. These projects could be in PPP or non-PPP mode, managed by different entities including Public Sector Companies, Public Finance Institutions et al.

As a next step, internationally recognized taxonomy should be used for green classification. Thereafter, each project could be evaluated using following filters:

- Near Revenue Stage
- Revenue Stage Projects
- At least one year of satisfactory commercial operation

Such a classification helps to determine the degree of risk from finance perspective. Since the projects are likely to have different lifecycle and investors, it is also important to assess 'investments-risk-duration' dynamics. This is likely to reveal asset-liability mismatch and hence can provide an informed idea of that stage of the project where new and cheaper sources of finance can come in through Infrastructure Debt Funds or where projects can be hived off in a de-risked special purpose vehicle for re-financing through InvITs or IDFs.

This will not only help in unlocking public finance to crowd in more private capital for new infrastructure projects but may also substantially reduce fiscal overhang by introducing circularity of finance. In other words, it can help both Banks and States to unlock capital for new projects.

Finance Department of the state government can set up a Green Finance Working Committee, essentially for the issuance of Green Bonds and approval of projects. Such a committee can again benefit from PDCOR's expertise while a dedicated Public Finance Management division (presently funded by the World Bank in Rajasthan) can simultaneously aid in public debt management.

Alternatively, Project advisory services could also be provided by NIIF but it may help that both PDCOR and NIIF could collaborate to structure the financing better and mutually enhance respective capacities for greater state action.

It may additionally help that the state creates a dashboard of Green projects and assets which could then be used to budgeting, financing and structuring purposes.

3. Maharashtra - Experiment with Green SDL

While the Rajasthan roadmap portrays a systematic institutionalisation at various levels, in the short term, states may follow the approach adopted by Maharashtra.

Maharashtra became the first state to establish Green Finance Working Committee (MGFWC), with the aim of generating INR 50 billion through green bonds to combat climate change. Led by the state finance secretary it comprised representatives from various departments such as planning, energy, environment and climate change, revenue, and forests.

The state sought to raise funds through SDL process for dedicated utilisation for projects related to renewable energy, green buildings, green hydrogen, electric mobility, and charging infrastructure.

This was very much in line with the Government of India's Sovereign Green Bond issuance in terms of its objectives and processes. However, unlike Sovereign Green Bonds, the Green-SDL currently does not qualify for a 'Greenium' and may require an enabling regulatory framework or greater interaction with investors.

Notwithstanding that, the Maharashtra example is an interesting one for two reasons. First, it entails a demonstration effect for other states and second it can engender an internal administrative capacity which can lead to much bigger ticket size over a period of time.

Steps enunciating the process for a Green SDL by states, its benefits and current limitations.

Steps enunciating the process for a Green SDL by states, its benefits and current limitations:

1. Cross –department coordination

- Cross collaboration between departments – set up a committee.
- Expanding the engagement to external stakeholders to include other capital market players (including stock exchanges, banks, investors, pension fund regulators) is desirable.

2. Establish a green bond framework

- **Determine eligible sectors**
 - i. In determining eligible green sectors, helpful to refer to existing categorisations such as SEBI Guidelines/Climate Bonds Taxonomy.
 - ii. It is recommended to consider how the selected sectors align with the India's wider climate policies, in particular **Nationally Determined Contributions (NDCs), alignment with NAPCC and SAPCC.**
- **Determine eligible types of expenditures in budget**
 - i. These could include direct investments or potentially intangible assets such as tax exemptions, subsidies, etc.

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- ii. Both new projects and refinancing of past projects as well as direct or indirect expenditures can be included.

- **Decide on reporting practices:**

- i. Set up a tracking and reporting procedure.

- 3. Identify eligible green budget items**

- Key departments (including energy, transport, water, agriculture, environment, development, etc.) identify eligible assets from their budgets;
- **The assets identified must be equal to or greater than the size of the bond.** Identifying more eligible assets than the planned bond size enables to upsize the issuance as well as prepare for future issuances.

- 4. Arrange independent review**

- A credible independent review and verification provides investors with assurance of the green credentials of the bond. An external advisor can also support the identification of the green portfolio.
- Options include a third-party certification against Climate Bonds' or a bespoke second-party opinion.

- 5. Issue the green bond**

- The usual steps for an SDL issuance will apply here.
- **Supporting materials** to promote the transaction can include a **green bond prospectus**, an investor presentation and an FAQ on green bonds.
- **Additional marketing material** can be developed to promote the issuance, showcasing the projects financed, the main elements of the **green bond framework** (eligible sectors, the guidelines/standards of reference, management of proceeds, reporting), and the **alignment with the government strategy** for economic growth/ job creation/poverty alleviation/transition to a low-carbon economy.

- 6. Repeat**

- Not all eligible expenditures may be included in a first green bond. Once a green bond framework is set up, most issuers return to market, revealing the benefits of labelling the issuance as 'green'.
- Some issuers opt for a programmatic approach, i.e. issue green bonds on an ongoing basis. The Climate Bonds Standard & Certification Scheme provides for programmatic certification, requiring one pre-issuance review and one yearly post-issuance review for all bonds issued during one year.

- 7. Benefit of Green SDL:**

- Internal capacity building, accountability and improvement of quality of expenditure.

- 8. Current Limitation:**

- Regulation for Greenium needs to be in place for Green-SDLs. This can enable enlargement of the financing envelope through the SDL route and improvement of quality of expenditure.

4. Odisha – Addressing Vulnerabilities through Public Finance Management

The practice of Fiscal Risk statement from Odisha can enable the structuring of the glide path for responsible fiscal management more effectively. It is also a recognised ‘Good Practice’ by the RBI. The first edition of state-level ratings captured under CARE Edge State’s Ranking Report, 2023, also recognises Odisha as the best-performing state in the fiscal category.

In the backdrop of high climate vulnerability owing to natural disasters and significant but volatile revenues from natural resources, Odisha’s fiscal performance has been impressive – a fact that can be attributed to the practice of regularly framing a Fiscal Risk Statement.

Key parameters of the Fiscal Risk Statement from Odisha

1. The fiscal risks are categorized into different categories such as Macroeconomic Risks due to various macroeconomic factors, risks from Public Private Partnership Projects, contingent liabilities in the form of guaranteed and non-guaranteed loans extended to the State PSUs and economic loss & damage of critical assets and infrastructure due to natural disasters
2. Fiscal Risk Analysis includes risk identification and quantification, risk classification, risk reporting in the form of disclosure statement and finally putting in place, suitable risk mitigation measures
3. Fiscal Risk Register is a top-down tool to identify different fiscal risks. It lists fiscal risks with both qualitative and quantitative analysis. Each identified fiscal risk is categorized based on the potential fiscal impact and the likelihood of materialization
4. Fiscal Risk Matrix is then used to classify financial risks in different categories
5. Using the PSUs Risk Analysis tool, financial health check of around 33 major operating PSUs is also being done

5. Andhra Pradesh Community-Managed Natural Farming

Rythu Sadhikara Samstha

The conventional agriculture relying heavily on synthetic fertilizers and pesticides is disrupting farming and food systems through intensifying farm, food, ecological and climate crises. **Natural Farming, Farming in harmony with nature, is a powerful solution for these multiple crises. AP has adopted the same as AP Community-managed Natural Farming, APCNF. Rythu Sadhikara Samstha, a not-for-profit company of GoAP implements APCNF.**

AP Community-managed and climate-resilient Natural farming (APCNF) is promoting a **transformational** technology that is **safeguarding our collective future** by incorporating the best global agroecology principles for climate change adaptation. The different NF practices include traditional practices of farmers, and farmers own innovations, in conjunction with emerging paradigms. APCNF's strength is that it is an iterative process, within the broad generic principles.

Universal principles of Natural Farming are:

- Soil to be covered with Crops 365 days (Living Root)
- Diverse crops, trees. 15-30 crops and more
- Increase organic residues on the soil
- Bio-stimulants as necessary catalysts
- Minimal disturbance of Soil
- Use indigenous seed
- Integrate animals into farming
- Pest Management through local botanical extracts
- No Synthetic Fertilizers, Pesticides, Herbicides

All these principles put together increase soil biology and thereby soil health and result in enhanced agriculture productivity, biodiversity, carbon sequestration and water availability. *APCNF reach-out is through harnessing the social capital of women self-help groups and their federations and promoting farmer-to-farmer experiential knowledge dissemination.*

APCNF's Implementation Model

While NF is a paradigm shift, the transfer of NF technology calls for the saturated transformation of a village rather than converting into a single farmer or single farm. Its four important elements/pillars include: small and marginal farm families and women farmers; women collectives (SHGs and their federations) taking charge of the programme planning,

implementation and tracking; knowledge and handholding support by best practitioner peers – community resource persons, more than 60% of them are women; farmer-led research, innovation, evidence, knowledge and learning; and saturating whole village towards total transformation. It takes 3-5 years to reach every farmer (80%+) in a GP. A farmer takes 3-5 years more to convert her entire holding and become a 100% seed-to-seed.

Transformation is accelerated through a focus on resource/model mandals, and consolidation. Value-chain and marketing to ensure fairshare of the consumer rupee to producers, enterprises of the educated young practitioners, and food, nutrition and health system approach are the triggers of this. Science, Research, Evidence-based Knowledge and learning is augmenting pace, deepening, and scaling. Apart from internal and farmers' research, national and International partners including FAO, CIFOR-ICRAF, CIRAD, UNEP, Univ of Reading, Univ of Edinburgh, Tuft University, ICAR Institutes, Local Universities, Digital Green etc., are collaborating. Indo-German Global Academy for Agroecology Research and Learning (IGGAARL) has been initiated with grant of 20M Euro from Govt of Germany, at Pulivendula, to take this Research and Learning forward.

Funds required to convert a farmer is estimated at Rs.15,000 spread over a period of 7-8 years. Capacity Building of farmers, farmer scientists and supporting institutions including women self-help groups and farmers' institutions - for promoting NF, inputs, models, enterprises, certification, linkages et al are key activity areas. Govt of India schemes - RKVY and PKVY - since 2016 and KfW since 2020 fund APCNF. Azim Premji Foundation and Co-Impact provide technical support and systems change support for seeding/scaling, communitisation and women's agency.

As on Dec 2023, APCNF has incurred about Rs.800 Crore.

Snapshot of APCNF (as of the end of December 2023)

- 9,352 field functionaries (best practitioner farmer - community resource persons)
- 9.6 lakh farm families in the journey of Natural Farming covering 4.09 lakh Ha. 2.5 lakh farm families are doing complete S2S. 4.0 lakh farmworkers are undertaking kitchen gardens
- This is 15% of the state's farmers, across 30% state's villages
- In 4853 villages with more than 3 years of APCNF presence, 70% of total farmers are on board into the NF transformation journey
- 11000 compact blocks, 15958 A-grade models, and 8209 ATM models. These models are giving year-round incomes, Rs.5,000 – Rs.25,000 per month
- Community-endorsed data (URVI app.); 250,000 farms are getting ready for certification

Key Results and benefits of adopting Natural Farming

- Reduced cost of cultivation and risks and increasing yields thereby generating regular income. Third-party studies, including studies by the Institute of Development Studies-AP, confirm
- Climate change resilience, thereby lesser risks in farming
- Better soil health, crop health, resilience, water savings, regenerating ecosystems, biodiversity, economic empowerment of farmers and dignity of labour, through NF farms
- More food, safe and nutritious food that is free of chemicals and health and nutrition benefits to farmers, consumers, villages, schools etc.
- Reducing the migration of youth from villages and creating reverse migration to villages
- Increased carbon sequestration, and reduced water and energy use
- Health and nutrition benefits to farmers, villages, schools, etc.

Internal analyses confirm that a farmer starts receiving benefits from Year 1 typically and these benefits tend to grow incrementally and perpetually. Benefit-Cost ratio of transformation, using an estimated 6% discount rate, exceeds 25 times in economic terms. Health benefits and ecological benefits are immense and are additional.

Partnerships

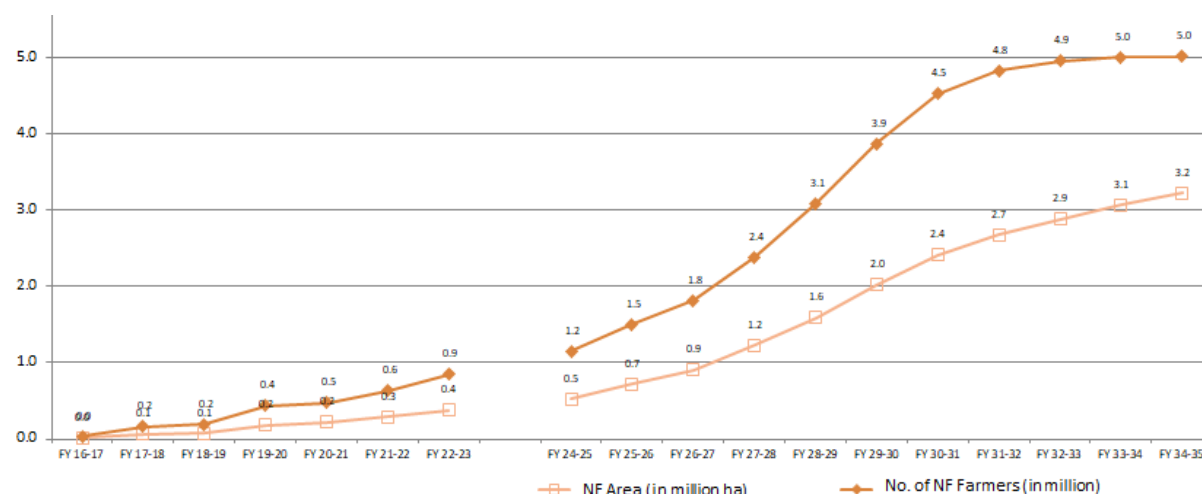
- I. APCNF works with several partners. Several Field NGOs and Resource NGOs (WASSAN, CSA, KF, JATTU and AFEC etc) are partnering in taking the programme forward.
- II. RySS converges with - SERP (increased ownership of the programme by women SHGs), Streenidhi (working capital for NF); Women and Child Development, WCD (H&N through nutri-gardens at Anganwadis, ICDS); Tribal Welfare and ITDAs (Tribal farmers into NF, value-chains, landscapes); Education (nutri-gardens, school curriculums); Agriculture University (projects, interns, research stations); Global Environment Facility (GEF) (7-8 landscapes work in Eastern Ghats); TTD (supply of NF products); and NCOL, AMUL and Phalada (marketing support for the NF produce).
- III. NITI Aayog (NF championing); MoA&FW (central schemes, National Mission); MoRD-NRLM (Mahila Kisan Sasakthikaran Pariyojana, MKSP); and ICAR and MANAGE (Research and Evidence, NF Curriculums) have recognized RySS as National Resource/Support Organization for taking NF across the country. NABARD's JIVA and GIZ have also partnered with APCNF for this purpose. Currently, APCNF is seeding NF in 14 states. The National Coalition for Natural Farming, NCNF, has been championing NF through Civil Society Organizations and working with states, along with RySS.
- IV. UNEP, SIFF, GASP (Global Alliance for Sustainable Planet) are bringing partners of support and working together. AFSA and other country networks are seeking masterclasses and

knowledge exchange. RySS is also interacting and support scaling-up in other countries including Sri Lanka, Indonesia, Rwanda, Kenya, and Mexico.

Plans: Accelerate, Scale and Replicate

Since launching in 2016, the program has scaled from 40,000 farmers to 0.9 million farmers in 2023, i.e. 21 times in 8 years. The next major milestone is to reach 5 million farmers across 28,840 villages in the next 12 years. (Refer to Table 3: Physical Expansion of APCNF).

Fig 9. Farmers & Area coverage under APCNF-Progress and Projections



The main investments in making this happen is on farmer-to-farmer extension system, building the capacities of the women self-help groups to motivate members, provide long term handholding support to make the transition of every farmer in the village, and to lead and manage the programme. The other investments are in building the natural farming knowledge, combining traditional knowledge, the best of modern science and farmers’ innovations. The investment in knowledge acquisition and in the dissemination of cutting-edge knowledge is responsible for ensuring that there is no transition loss in even in the first year.

There are no subsidies in this programme. It is an investment in human and institutional capacity development. The effort is to make transition an ‘opportunity’ and not a ‘cost’, right from year 1. That is the USP of this programme. (refer Table 5 for a detailed break up of per farmer cost)

To achieve rapid growth in Andhra Pradesh, RySS is looking for catalytic grant funding or low-cost loans. RySS is looking for USD25m per year in bridge funding in 2024, 2025, 2026, 2027. This USD100m in bridge funding will be allocated to capacity building and human resource activities which will unlock an additional USD2000 m in state and national subsidy funding by reducing the aggregate farmer demand for fertilizer and energy subsidies.

RySS intends to use part of this subsidy to retire the loan and create a climate fund of USD400m with the community. The women SHGs will be motivated to keep aside some money each month to supplement this Climate change resilience fund. The Community can utilize this money for sustaining the programme, and for any other interventions for the benefit of their members.

More importantly, it results in additional net incomes of USD8.4 billion, only on account of lower costs, lower risks and higher yields. Not accounting for any premium prices or carbon benefits. (Refer to Table 4: Economic benefits to farmers)

RySS further aims to take **NF outside Andhra Pradesh and India**. NF can be scaled up to 120 million farmers in India and it can be an inspiration to other countries in the global south to replicate this success. The RySS model is now scaling in 14 states across India. More and more states are looking to AP for inspiration and technical support.

RySS is also developing sister programs in SE Asia, East Africa, West Africa, and Latin America.

Table 3. Physical Expansion of APCNF

Physical Expansion of APCNF								
S.N.	Year	Villages	Farmer Service Centre (RBK)	Village women SHG federation (VO)	Farmers Covered (in Mn)		Net Cultivated Area (In Mn Ha)	
					Total	% of AP	Total	% of AP
0	FY 23-24	3,730	3,007	7,700	0.9	14%	0.3	6%
1	FY 24-25	6,730	6,007	11,676	1.2	19%	0.5	9%
2	FY 25-26	11,501	10,778	16,447	1.5	25%	0.7	12%
3	FY 26-27	13,370	10,778	25,360	1.8	30%	0.9	15%
4	FY 27-28	13,370	10,778	28,840	2.4	40%	1.2	21%
5	FY 28-29	13,370	10,778	28,840	3.1	51%	1.6	27%
6	FY 29-30	13,370	10,778	28,840	3.9	64%	2.0	34%
7	FY 30-31	13,370	10,778	28,840	4.5	75%	2.4	41%
8	FY 31-32	13,370	10,778	28,840	4.8	80%	2.7	45%
9	FY 32-33	13,370	10,778	28,840	4.9	82%	2.9	49%
10	FY 33-34	13,370	10,778	28,840	5.0	83%	3.1	52%
11	FY 34-35	13,370	10,778	28,840	5.0	84%	3.2	54%

Table 4. Economic benefits to farmers

Economic benefit to farmers (USD Mn)								
S.N.	Year	Farmers Covered (in Mn)	Net Cultivated Area (In Mn Ha)	USD Mn	Additional Income to Farmers (USD Mn)			
				Indicative APCNF Cost	Transition to APCNF	Value Addition	Eco-system Credits	Total
1	FY 24-25	1.2	0.5	70	140	36	59	235
2	FY 25-26	1.5	0.7	66	212	52	85	350
3	FY 26-27	1.8	0.9	91	290	68	111	469
4	FY 27-28	2.4	1.2	115	406	95	151	652
5	FY 28-29	3.1	1.6	122	529	125	193	847
6	FY 29-30	3.9	2.0	106	697	163	248	1,108
7	FY 30-31	4.5	2.4	107	883	201	306	1,391
8	FY 31-32	4.8	2.7	80	1,070	235	357	1,661
9	FY 32-33	4.9	2.9	73	1,252	266	403	1,921
10	FY 33-34	5.0	3.1	51	1,406	295	436	2,137
11	FY 34-35	5.0	3.2	44	1,541	322	461	2,324
	Total	5.0	3.2	924	8,424	1,859	2,811	13,094

Table 5. Detailed break up of per farmer cost

Per Farmer detailed break up of APCNF Cost (in USD)			
Detailed Head of APCNF Cost	Per Farmer Cost (USD)	% of Subtotal	% of total
Village-level Transformation Cost			
Community Cadre - stipend, travel and training cost	60.1	46%	34%
NF Farmer capacity building cost	0.6	0.4%	0.3%
Farmer's annual plan and verification expenses	5.6	4%	3%
APCNF local innovation, research and model cost	8.6	7%	5%
Other Program cost	6.2	5%	3%
Institution Building Cost	18.6	14%	10%
Farmer Scientist Cost - stipend, travel and training cost	31.2	24%	17%
Sub Total	130.8	100%	73%
APCNF Project Management Cost	19.5		11%
Academy Cost (Technical Support and Management Cost)	10.0		6%
NF University Cost	18.9		11%
Total	179.2		100%

Annexure – I

Indicative List of Assets

Sector	Description		Investment Required by 2030 (in Rs. Cr)			Rationale
	Investment Scenarios for State Generation Utility (Annexure- II)					
Power: Generation			Business As Usual Scenario	Redirecting Capital for Accelerated Transition	Accelerated Decarbonisation	Currently the state Genco holds a 50% share in meeting4 state electricity demand. Therefore, diversification scenarios for state Genco have been considered. This will also contribute to RPO and RGO compliance.
	Generation	Coal	15,782.35	NIL	NIL	
		Solar	4860.95	19,659.27	37,881.33	
	Transmission		775.00	4,762.50	9,137.50	
	BESS		3,457.13	3,457.13	3,457.13	
	Total		23,303.08	27,878.90	50,475.96	
Transmission	Approved and Proposed Transmission Investments					
	Proposed International Competitive Bidding (ICB)				Investment Required (Rs in Cr)	Time Horizon
	ICB 1		Proposed Package List of RVPN for GEC -II (KfW funded projects)		631.23	
	ICB 2				276.38	
	ICB 3				115.18	
	A. Subtotal				1022.79	
	400/200 kV Udaipur GSS		Revised Proposal of RVPN for inclusion of the transmission schemes under GEC -II		466.05	
	220/132kV Dungarpur				165.18	
	132kV Dalot GSS				115.18	
	B. Subtotal				746.41	
	765/400 kV Jodhpur		Financial sanction approved for RVPN transmission system uprating, upgrade and strengthening scheme for RE evacuation in Western Rajasthan		3089.93	
	765/400 kV Jaisalmer				3060.89	
	400 kV Bhadla		Administrative & Financial Sanction for transmission system for RE Evacuation from Bhadla-Bikaner Regions		1678.20	
	400 kV Bikaner				699.86	
	C. Subtotal				8528.89	
	Total (A+B+C)				10298.09	

Mobility	250 EV Charging Station	Approved in the Budget 2023-24	75	Annual Investments by 2023-24
	Procurement Plan of 1000 Electric buses by 2025 by Jaipur City Transport Services Limited (JCTSL)			
	Procurement of 300 buses for 2023-24	Required VGF	59	Annual Investments by 2023-24
	Procurement of 300 buses for 2024-25		130	Annual Investments by 2024-25
	Procurement of 400 buses for 2025-26		240	Annual Investments by 2025-26
	Construction of Depot for E- Buses		60	
	Electricity connection for charging infra		30	
	Subtotal		519	
	Procurement of 450 Electric Buses and 550 BS-VI Buses (tenders invited for 340 buses as of Jan,2024) by RSRTC			To be bought in tranches by 2026-27
	40000 EV Charging Stations by 2030	Scenario Analysis for estimation of EV charging station by Indicc Estimated EVs in RJ by 2030: 9,00,000 EV Requirements of EV Charging Stations – 30000 to 40000	7000	
Energy	Policy Interventions	Comprehensive Mobility Plan, Jodhpur		
		Comprehensive Mobility Plan, Jaipur		
Energy	Projects and assets that could emanate from MoUs – Green Hydrogen and Green Ammonia plant (Jackson Group)		22400	Cumulative Investments by 2028
Adaptation	Sustainable Agriculture	Scaling up of Natural Farming in Rajasthan Budget 2022-23 has approved Rs 600 Cr for scaling up NFM with Centre: State share in the ratio 60:40	240	Cumulative Investments by 2030

Annexure – II

Rajasthan Rajya Vidyut Utpadan Nigam Ltd. Transition Scenarios and Investment Requirement

The quantum of solar generation capacity that will be required by RVUN to retain a significant portfolio in supplying electricity to state discoms by 2030 (i.e. 33% share is retained by RVUN) has been calculated. Generation capacity factors in the impact of decommissioning RVUN's existing coal assets that are eligible for retirement based on some selected parameters along with the announcement of incremental capacity addition through solar and coal.

- **Scenario 1 - Business as Usual (BAU):** Here, the proposed coal power capacity (2.2GW) is considered to be commissioned by 2027, with an addition of 810 MW of Solar capacity in 2024 (announced in the FY22 budget). At the same time, considering a realistic decommissioning trajectory based on historical trends, existing coal assets past 35 years are considered for retirement
- **Scenario 2 - Redirecting Capital for Accelerated Transition (RCAT):** Here, the retirement of coal assets past the age of 30 years is considered. Further, we assume zero capacity addition for the concerned period. We also assume that the equity capital budgeted by Government of Rajasthan is redirected towards solar PV capacity addition. The solar PV capacity addition in this scenario shall be in addition to the capacity simulated in Scenario 1
- **Scenario 3 - Accelerated De-carbonization (AD):** This scenario involves aggressive de-carbonizing by retiring the existing coal plants at 25 years and shelving the current plans to add new coal capacity. We have considered that the share of Rajasthan's energy requirement met through RVUN's generation in 2030 shall remain at 33%, which is achieved through an accelerated addition of solar PV capacity by the utility

Table 1. Transition Scenarios for RVUN

	Solar Addition (MW)	Coal Addition (MW)	Coal Retirement (MW)
Business as Usual (BAU)	810	2245	640
Redirecting Capital for Accelerated Transition (RCAT)	4842	0	1100
Accelerated Decarbonisation (AD)	24151	0	2295

The transition to a low-carbon economy necessitates substantial capital investment to support new technologies, infrastructure development, and the phase-out of fossil fuel-related infrastructure. In the case of RVUN, the finance requirements outlined in this report primarily encompass upfront capital costs and associated infrastructure expenses, such as transmission and storage costs. Ensuring adequate financial planning is essential for a successful and sustainable transition of the utility.

Total investment cost in BAU is Rs 23,303.08 Cr (Generation – Rs 19,070.95 Cr; Transmission- Rs 775 Cr and BESS – Rs 3,457.13 Cr); RCAT is Rs 27,878.90 Cr (Generation – Rs 19,659.27 Cr;

Transmission- Rs 775 Cr and BESS – Rs 4,762.50 Cr); and AD is Rs 50,475.96 Cr (Generation – Rs 37,881.33 Cr; Transmission- Rs 9,137.50 Cr and BESS – Rs 3,457.13 Cr). It is seen that the investment requirements can vary between INR 23,303 crore to INR 50,475 crore until 2030 and the annual investment requirements would also depend on the adopted policy.

Table 2. Details of Benchmark Costs for Estimating Financing Requirements of RVUN

Particulars	Costs	Unit	Source
Capital cost of Coal power plant	7.3	Cr/MW	Compiled from the data presented in Rajasthan state budget FY2023
Capital Cost of Solar power plant	4.1	Cr/MW	IEEEFA, 2022 ^c
Benchmark price of BESS	1,757	Cr/GWh	Estimating energy storage requirements for Rajasthan Grid, Bask Research Foundation, 2023

Table 3. Investment Requirement for RVUNL by 2030

Scenarios/ Cost	Capital Cost for Coal Generation (Rs in Cr)	Capital Cost for Solar Generation (Rs in Cr)	Capital Cost for BESS (Rs in Cr)	Capital Cost Transmission Infrastructure (Rs in Cr)	Total Cost (Rs in Cr)
Business as Usual (BAU)	15,782.35	3,288.60	3,457.13	775.00	23,303.08
Redirecting Capital for Accelerated Transition (RCAT)	NIL	19,659.27	3,457.13	4,762.50	27,878.90
Accelerated Decarbonisation (AD)	NIL	37,881.33	3,457.13	9,137.50	50,475.96

Table 4. Portfolio Mix of RVUNL under different Scenarios by 2030

S. No	Fuel	2022	%	BAU2030 (MW)	%	RCAT2030 (MW)	%	AD2030 (MW)	%
1	Coal	7,830	91%	9,435	86%	6,730	55%	5,535	35%
2	Gas	604	7%	604	5%	604	5%	604	4%
3	Hydro	164	2%	164	1%	164	1%	164	1%
4	Solar	0	0%	810	7%	4,842	39%	9,330	60%
	Total	8,597	100%	11,012	100%	12,340	100%	15,633	100%

^c https://ieefa.org/sites/default/files/2022-05/Solar%20Tariffs%20to%20Rise%20by%2021%25%20in%20the%20Next%2012%20Months_May%202022.pdf

Fig 10. Detailed Investment Analysis

Financial Year	2022	2023	2024	2025	2026	2027	2028	2029	2030
Rajasthan Electricity Demand (MW)		16,291	17,841	18,753	19,648	20,590	21,537	22,500	23,534
Rajasthan Electricity Demand (MUs)		1,01,757	1,11,955	1,17,849	1,23,668	1,29,797	1,35,979	1,42,286	1,49,063
Energy Share of RVUN (% MUs)	50.0%								33.0%
SCENARIO III (INR 50,475.96 Crore)									
Estimation of Public Investments in RVUNL (Rajasthan GenCo) - Scenario III	2022	2023	2024	2025	2026	2027	2028	2029	2030
Coal Power Retired in the year (@ 25 years)		-	-	1,350	-	500	250	195	-
Solar Photovoltaic Investments for RVUN									
Solar Power Addition in the year (MW)		-	810	407	612	920	1,382	2,077	3,122
Cumulative Solar Capacity (MW)		-	810	1,217	1,829	2,749	4,131	6,209	9,330
Yearly Investments for Solar PV - RVUN (Cr)		3288.6	1654	2485	3734	5612	8434	12674	
ESS Investments for RVUN			1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
ESS capacity addition (GWh)		-	0.37	0.58	0.82	1.07	1.35	1.64	1.97
Yearly Investments for BESS - RVUN (Cr)		649.13	375.82	409.13	447.36	483.82	522.20	569.67	
Estimation of Public Investment in RVPN (Rajasthan TrasCo)									
Required intra-state transmission infrastructure capacity addition in the year (GW)		0.00	0.63	0.32	0.48	0.72	1.08	1.63	2.45
Annual investments by RVPN		793.26	398.85	599.40	900.78	1,353.69	2,034.33	3,057.20	
Yearly Investments in RVUN and RVPN (Rs. Cr)		4,730.98	2,428.20	3,493.44	5,082.48	7,449.50	10,990.25	16,301.10	-
Investments by GoR assuming 20% equity contribution (Rs. Cr)		946.20	485.64	698.69	1,016.50	1,489.90	2,198.05	3,260.22	
SCENARIO II (INR 27,878.90 Crore)									

Estimation of Public Investments in RVUNL (Rajasthan GenCo) - Scenario II	2022	2023	2024	2025	2026	2027	2028	2029	2030
Coal Power Retired in the year (@ 30 years)		-	-	850	-	-	-	250	-
Solar Photovoltaic Investments for RVUN									
Solar Power Addition in the year (MW)		-	810	281	379	510	688	926	1,248
Cumulative Solar Capacity (MW)		-	810	1,091	1,470	1,980	2,668	3,594	4,842
Yearly Investments for Solar PV - RVUN (Cr)		3288.6	1142	1538	2072	2792	3761	5066	
ESS Investments for RVUN			1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
ESS capacity addition (GWh)			0.37	0.58	0.82	1.07	1.35	1.64	1.97
Yearly Investments for BESS - RVUN (Cr)		649.13	375.82	409.13	447.36	483.82	522.20	569.67	
Estimation of Public Investment in RVPN (Rajasthan TrasCo)									
Required intra-state transmission infrastructure capacity addition in the year (GW)		0.00	0.64	0.22	0.30	0.40	0.54	0.73	0.98
Annual investments by RVPN		796.67	276.59	372.62	501.98	676.26	911.04	1,227.34	
Yearly Investments in RVUN and RVPN (Rs. Cr)		4,734.40	1,794.15	2,319.88	3,021.48	3,951.63	5,193.97	6,863.39	-
Investments by GoR assuming 20% equity contribution (Rs. Cr)		946.88	358.83	463.98	604.30	790.33	1,038.79	1,372.68	
SCENARIO I (INR 23,303.08 Crore)									
Estimation of Public Investments in RVUNL (Rajasthan GenCo) - Scenario I	2022	2023	2024	2025	2026	2027	2028	2029	2030
Coal Power Capacity Addition in the year (New)						2,245			
Coal Power Retired in the year (@ 35 years)		-	-	640	-	-	-	-	-
Yearly Investments for Coal - RVUN (Cr)									

Coal Capacity Investments for RVUN						15,782			
Coal Power Addition in the year						2,245			
Yearly Investments for Coal Power - RVUN (Cr)		3,946	3,946	3,946	3,946				
Solar Photovoltaic Investments for RVUN									
Solar Power Addition in the year (MW)		-	810						
Cumulative Solar Capacity (MW)		-	810	810	810	810	810	810	810
Yearly Investments for Solar PV - RVUN (Cr)		3288.6	0	0	0	0	0	0	
ESS Investments for RVUN			1.0%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%
ESS capacity addition (GWh)		-	0.37	0.58	0.82	1.07	1.35	1.64	1.97
Yearly Investments for BESS - RVUN (Cr)		649.13	375.82	409.13	447.36	483.82	522.20	569.67	
Estimation of Public Investment in RVPN (Rajasthan TrasCo)									
Required intra-state transmission infrastructure capacity addition in the year (GW)		0.00	0.62	0.00	0.00	0.00	0.00	0.00	0.00
Annual investments by RVPN		-	775.00	-	-	-	-	-	
Yearly Investments in RVUN and RVPN (Rs. Cr)		7,883.31	5,096.41	4,354.72	4,392.95	483.82	522.20	569.67	-
Investments by GoR assuming 20% equity contribution (Rs. Cr)		1,576.66	1,019.28	870.94	878.59	96.76	104.44	113.93	

Annexure – III

High-Level Analysis of Rajasthan's EV Sector

Rajasthan state has shown a proactive approach towards green transition as reflected in its **EV Policy 2022** and **CNG Policy 2022**.

Rajasthan EV Policy, 2022

The policy formulated by the Transport Department has been envisaged to promote EV adoption in both public and private mobility segments, to create a robust network of charging infrastructure and to enable conducive regulatory environment for the manufacturing of EV and batteries in the state. The policy entails financial incentives like SGST reimbursement, tax exemptions, power tariff rationalization, etc.

Policy targets

Category	Target (at the end of five years i.e., 2027-28)
e Two wheelers	15% EV share in new vehicle registrations
e Three wheelers	30% EV share in new vehicle registrations
e Four wheelers	5 % share in new vehicle registrations
E Buses	Phased Transition to e buses used in the routes connecting priority cities

Growth Forecast for EV in Rajasthan for next 5 Years as per policy targets

Based on the data of registered vehicle sales (two wheelers, three wheelers and four wheelers) in Rajasthan for the period between 2015 - 2019 (Vahaan Dashboard), following are the CAGRs (compounded annual growth rates) of the respective categories:

- Two wheelers (NT) – 3.18%
- Three wheelers (T) – 8.51%
- Four wheelers (LMV) – 2.27%

Using the CAGR for each Categories, following are the total registered vehicle sales and EV sales as per the stated policy for the year 2027-28

Vehicle category	Total sales in the year 2027-28	EV target sales (as per the policy)	Total EV sales for the year 2027-28
Two-wheeler	11,00,000	15%	1,60,000
Three-wheeler	60,000	30%	18,000
Four-wheeler	3,20,000	5%	16,000

Given the above, total EV vehicles in the year 2027-28 will be as follows

- Two Wheelers - 7,00,000
- Three-wheelers - 1,50,000
- Four wheelers - 50,000

Total Electric vehicles as on 2027 - 28 = 9 lakhs (approx.)

In the Budget 2023-24, Government of Rajasthan has allocated **Rs. 75 crores** for setting up **250 charging station** in Rajasthan, which means roughly **Rs. 30 lakh** is required to set up a public charging station in Rajasthan.

According to a white paper by Alvarez and Marsal, the global ideal EV/public chargers ratio is also around 6-20 EVs per public charger. In that case, number of public charging stations required for meeting the demand in Rajasthan for 9 lakh EVs amounts to roughly 30000-40000 publicly charging access points (roughly 6000 - 7000 charging stations) in the next 5 - 7 years.

This will result in the investment opportunity of around Rs. 6000-7000 crore by 2030 for public and private sector organizations. This will result in increased demand for both electricity and associated grid infrastructure.

Rajasthan EV Policy 2022 - Analysis

As per the policy objectives and targets, it is estimated that around **1 million EVs (approx.)** will get registered in the next 5 years (by 2027 - 2028). The aforementioned targets appear to exhibit a lower degree of policy ambitions in comparison to the progressive targets articulated at the national level.

As per the report prepared by the Energy Transition Advisory Committee (*The Green shift*, 2023), it is estimated that approximately **80 million EVs** will be sold by 2030, of those, 70% are expected to be two and three wheelers, and the rest will be cars and buses. The **20th Electric Power Survey** (Central Electricity Authority), released in November 2022 also envisages roughly 60 million EVs on road by 2030. The optimistic targets presented at the National Level should be congruent with the targets at the sub - national level. Rajasthan's contribution to the National GDP is around 5 - 6%, equating it with the EV sales by 2030, around **3.5 - 4 million EVs** sales should be registered by 2030. This highlights the need for Rajasthan state to recalibrate its policy targets so as to provide the necessary policy nudge and regulatory environment towards rapid EV adoption.

E-Buses Adoption in Rajasthan - Critical for Clean Energy Transition and Electrification of Public Transportation System

Increased share of public transport and electrification of public transport are two key policy priorities of Government of India (GoI) towards meeting mobility needs and reducing oil

demand, thereby mitigating the sector's air-pollution, Green House Gas (GHG) emissions and import dependence (NITI Aayog, 2017). Instead of growing with passenger demand, bus service levels in India in general and Rajasthan in particular have stayed relatively stagnant over the years due to the poor financial situation of State Transport Undertakings (STUs).

In Rajasthan, **Rajasthan State Road Transport Corporation** and other city level transport require viability gap funding to cover cost of service delivery, rising fuel and staff costs et al. In this context, electric buses offer a lower operating cost alternative with energy cost at least 50% lower than that of a diesel or Compressed Natural Gas (CNG) buses and benefit from relatively stable electricity prices.

Current scenario of e- buses deployment in Rajasthan

Public sector - Transport Department, GoR has initiated tender procedures for procuring 10 e buses in the near future along with rapid deployment of BS - VI and CNG buses.

JCTSL has proposed expansion of the fleet which consists of 300 e - buses procurement in the next 2-3 years by outsourcing CESL (Convergence Energy Services Limited), a PSU of Power Ministry to bid for these procurements based on GCC (Gross cost contracting) model.

Private sector - Private companies such as NueGo are providing intercity e- bus services on the major routes such as Jaipur - Delhi, Jaipur - Agra, etc.

Policy intervention for rapid e-bus deployment in Rajasthan

The **Government of Rajasthan** should shift its complete focus towards e-bus service contracting at scale, focused on service delivery rather than bus purchase (**Mobility as a service concept**). A successful example of this type of model has been the recently (April 2022) concluded bidding process for services of 5,450 electric buses in 5 cities (Delhi, Mumbai, Bangalore, Hyderabad, Surat). **NITI Aayog** and **Convergence Energy Services Limited (CESL)**, a public sector undertaking, have concluded the largest global tender for electric bus procurement through a **Grand Challenge (GC) process**. The GC **aggregated demand** across cities, **homogenised their procurement specifications** and carried out the tendering process to procure buses on a **Gross Cost Contract (GCC) basis**. Given the significantly lower costs of electric buses discovered by the GC when compared to the current cost of diesel and CNG buses, electric buses should become the priority for intra-city and inter-city transport entities in Rajasthan. Alignment of States' e-bus procurement policy with the **National E Bus Programme** (50,000 e-buses by 2030) will enable rapid advancement of electric buses in India.

