Land and Asset Repurposing and Sustainable Post Closure Use of Mine Lands in the Context of Just Transition

Land Repurposing is one of the three pillars of the World Banks Just Transition for All Approach, which are: (1) Institutional Governance; (2) People and Communities; and (3) Environmental Reclamation and Repurposing of Lands and Assets. These three Pillars combine with three characteristic phases in coal transition: (1) Pre-Mine-Closure Planning; (2) Mine Closure; and (3) Regional Transition. This "3x3 matrix", as well as interconnections between the pillars and phases is shown in Figure 1[1]. Land repurposing should ideally be fully integrated in both "mining for closure" and mine closure, and thus is incorporated in most modern closure toolkits[2].

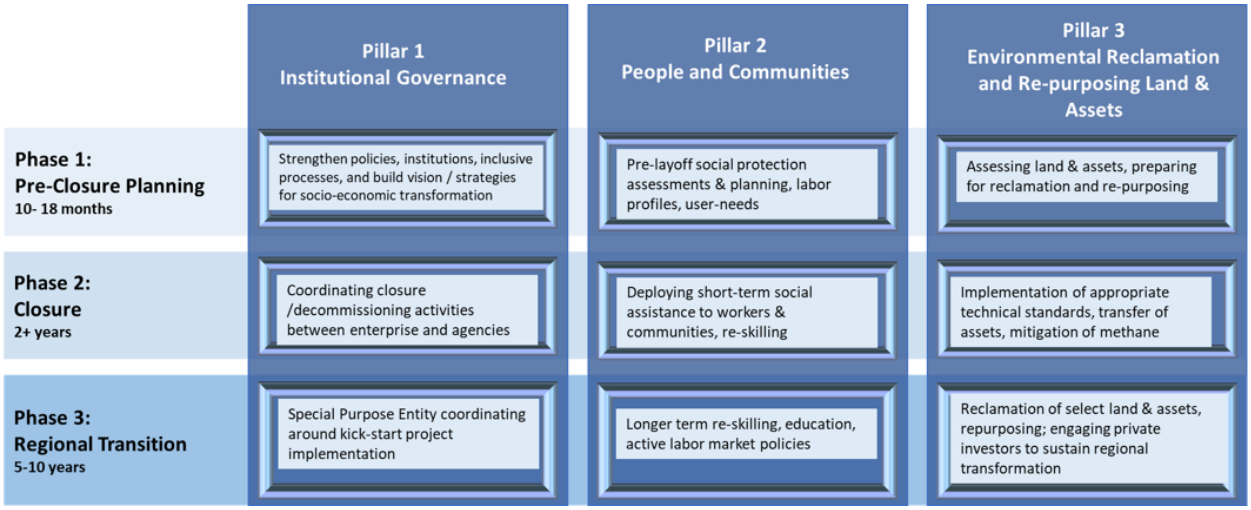

***Figure 1*: The "3x3 Matrix" is the "road map" of the World Bank's Just Transition Approach. It comprises three thematic pillars, each of which contains activities specific to three phases of mine closure, ranging from a pre-closure planning phase to the actual physical closure works, to post closure regional transition works.**

The key activities under the Pillars of the 3x3 Matrix are the following:

(i) **Pillar 1:** Strengthen policies, institutions, inclusive processes, and build vision / strategies for fiscal, macro-economic & socio-economic transformations with communities; Coordinating closure /decommissioning activities between enterprise and agencies; Special Purpose Entity coordinating transition project implementation, managing funding sources.

(ii) **Pillar 2**: Early-stage dialogue and community engagement to ensure local voice and influence in planning; Appraisal of social sustainability outcomes; Pre-layoff social protection assessments & planning, labor profiles, user-needs; Social assistance to workers &

[1] Stanley, Michael C.; Strongman, John E.; Perks, Rachel Bernice; Nguyen, Helen Ba Thanh; Cunningham, Wendy; Schmillen, Achim Daniel; Mccormick, Michael Stephen.2018. Managing Coal Mine Closure : Achieving a Just Transition for All (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/484541544643269894/Managing-Coal-Mine-Closure-Achieving-a-Just-Transition-for-All

[2] for example: World Bank. 2021. Mine Closure : A Toolbox for Governments. World Bank, Washington, DC. © World Bank. https://openknowledge.worldbank.org/handle/10986/35504, License: CC BY 3.0 IGO.

communities, re-skilling, Active Labor Market Policies; Community engagement in prep, management, repurposing of closed facilities; Longer term re-skilling, education, Active Labor Market policies, preparing workers for Future Jobs; Locally-led, participatory planning for adaptive management, CDD/Smart Villages investments

(iii) **Pillar 3:** Assessing land & assets, preparing for reclamation and re-purposing, resourcing ENV remediation costs, implementation of appropriate technical standards, transfer of assets, mitigation of methane, environmental remediation of selected lands & assets by private / public sector, re-zoning, re-permitting and repurposing for economic diversification to initiate and sustain regional transformation

Figure 2 below summarizes the role of land and assets repurposing throughout the three phases.

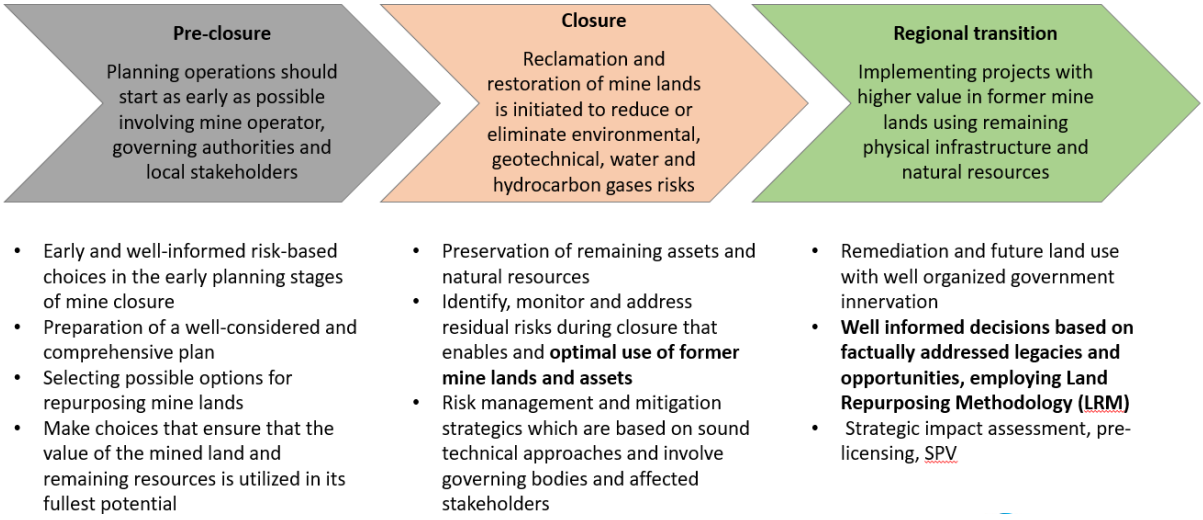

***Figure 2*: The role of land repurposing throughout the three phases of mine closure.**

Figure 3 maps out the potential range of potential low carbon economic activities on post mining lands.

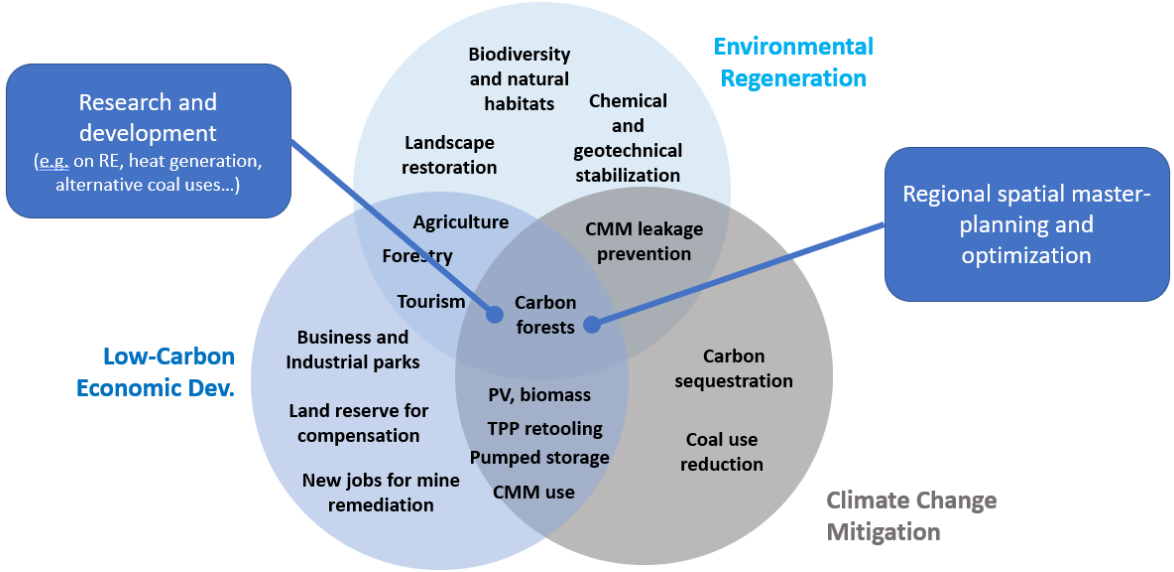

***Figure 3*: Land repurposing and spatial planning contribute to three major objectives of coal transition: (i) climate change mitigation; (ii) diversified post carbon economy and energy production; and (iii) environmental regeneration of mining lands.**

The upstream consideration of land utilization scenarios and planning and implementing repurposing activities has a multi-faceted impact on many other transition activities—whether job creation, circular economy, clean energy production, facilitation of economically diversified investments, stakeholder engagement and the quality of life of a post mining community.

Approach to Land Repurposing

A Land Repurposing Methodology (LRM) is an objective tool used for the determination of post mining land use scenarios with customizeable spatial resolution and a high degree of reproducibility. The methodology stimulates thinking and planning much beyond just achieving environmentally stable, safe post-mining / post-industrial landscapes and complying with environmental permits; it aims to return former mining or industrial lands into a condition that allows for a wide scope of subsequent, diverse and sustainable land uses. This is of critical priority in economic transition scenarios where land may be one of the primary and most important assets available for development, and also play an important role as collateral for raising financing.

The methodology developed is based on five themes with respective parameter groups: morphology, hydrography, geotechnical risks, socio-economic factors and land value (both positive as added value and negative as remediation cost); further parameters, e.g. permitting requirements or restrictions can be added as required by the various stakeholders. The methodology informs on which types of post-transition use make sense to plan for on a given parcel of land based on its current condition but does not prescribe a specific investment scenario. As such it is not a standalone tool. This would be a level more granular, e.g. in a spatial planning exercise. Other planning instruments connected to LRM can be preexisting, hierarchically higher level, covering wider geographic scopes (e.g. regional spatial plans, national energy strategies, special spatial plans); or they can be parallel, on the same level and laterally connected (e.g. economic development plans of adjacent municipalities). LRM is an especially useful tool to apply prior to, or in conjunction with a new or updated spatial plan, as it contributes an objective assessment of future land uses.

Land Repurposing Steps

Land Repurposing follows a logical process for assessment and planning that has the following steps:

	Step	**Description**
1	Stocktaking and site inventory	Including current and historical land use, landforms and topography, operational records, geotechnical and hydrographic monitoring data, geochemical data on soils, surface water and ground waters;
2	Clarification of the legal, regulatory and permitting situation	Dialogue with key stakeholders (including owner, operator, regulator, communities / regions, business associations, academia, civil society) on potential future use of post-transition lands and assets as well as the requirements for technical and economic feasibility studies, environmental / social assessments, repurposing plans and permits;
3	Site investigation and monitoring	Development of supplemental site investigation and monitoring programs, as required; this step may be minimal or entirely absent for initial / screening assessments;

	Step	Description
4	Land Classification Methodology	Establishment and application of a land classification methodology; categorization of discrete land parcels regarding their post-transition utilization potential;
5	Repurposing Strategies	Use of the outcomes of steps 1-4 for the formulation of repurposing strategies and as contributions for other spatial planning instruments, e.g. specific spatial plans for post-transitional lands and their functionally linked surroundings.

Generally, extensive site visits and stocktaking, interviews with various functions in the current operators' management and operational departments, and drawing from international experience, practice and future trends will be required to develop meaningful criteria for assessing and classifying lands regarding their post-transition potential. Typical sets of criteria span current land use, biological, physical, chemical, social-economic and financial inputs and yield information on key questions around post-transition lands' repurposing potential: (i) location and redevelopment potential; (ii) environmental and geotechnical risks / liabilities; (iii) topography and hydrography and (v) development potential / added value and financial risks. For individual projects or sites detailed, tailored evaluation criteria are developed to screen, classify and rate land parcels regarding their potential for post-transition utilization options.

These criteria were then combined with broad scenarios for post-mining repurposing, which again are customized for individual projects or sites. Examples for post-transition use can include (i) renewable / clean energy production and storage; (ii) industrial production; (iii) waste processing and recycling; (iv) agriculture / horticulture / forestry; (v) recreation / tourism / natural habitats; and (vi) office / research / technology parks. These scenarios define the land repurposing categories for a given post-transition area. The methodology takes cost sensitivity into account, striving to avoid e.g. costly remediation or upgrading measures for a particular purpose, if other areas are available that are equally or better suitable and require lower investment costs to be fit for a productive purpose. The outputs are optimized land use scenarios that minimize risks and maximize added value for future social and economic development.

The below figures show examples of various combinations of land properties and characteristics matched with potential utilization scenarios (four utilization scenarios, matched with five underlying criteria). These "radar charts" allow a quick assessment, categorization and testing of lands' suitability for a specific envisaged utilization. They also form the basis for mathematical algorithms that are used for automated assessment routines in e.g. cloud-based GIS environments.

Such a user-friendly, cloud-based GIS application ("LURA" – land utilization repurposing application) was prepared under a technical advisory project led by the World Bank and incorporates all above steps and their analytical processing. An additional advantage is that it can be accessed by multiple stakeholders, facilitating information sharing and technical discussions utilizing the same underlying information and criteria, thus removing a significant part of subjectivity and supporting consensus-building joint decision-making. The software of this app follows the above-described methodological approach via a simple mathematical algorithm which processes user-input indices and produces a map visualizing recommended optimized post-transition land uses.

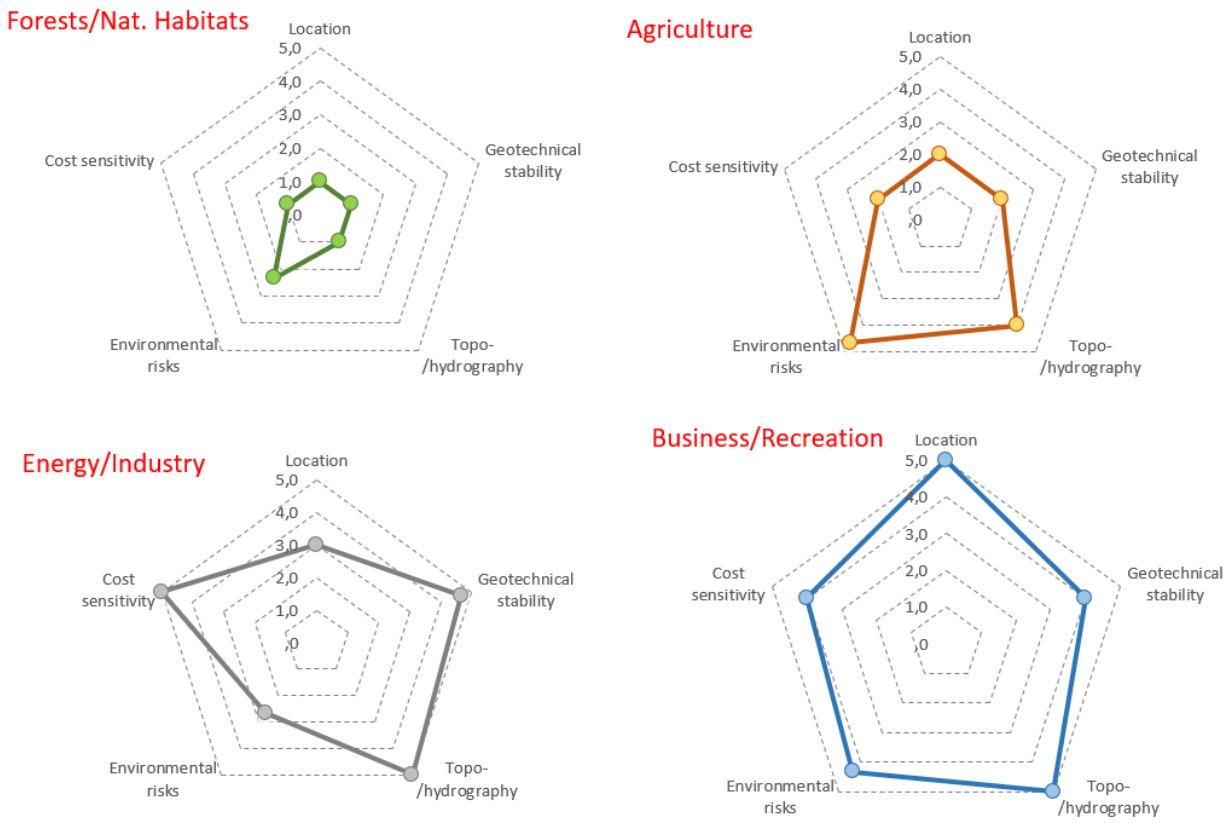

Figure 4: Example of four exemplary land repurposing scenarios, based on five defining criteria.

The outcome of the land repurposing methodology is to apply the results described above to formulate a repurposing development strategy for the project / site, alongside other spatial planning instruments. This step follows general spatial planning methodologies and would entail the following elements:

1) Match the land properties (as expressed in the identified land categories) with potential land utilization options. The basis of this planning element is the land use zoning map produced under the land categorization activity. This allows a first, approximative assignment of spatial elements and dedicated zones that incorporates both the constraints imposed, and opportunities presented by the physical and chemical characteristics of former mining lands. A form of risk-based approach is embedded into this procedure in which current conditions are assessed and hazards are identified in order to propose future land utilizations with lower risks.
2) Allow for environmental and social impact assessments (ESIA) to guide land repurposing planning and to encourage pre-licensing of utilization typologies. The environmental and social constraints and boundaries established by the ESIA would guide spatial planning, especially the definition of land use zones and the allowable activities within these which in essence increase future land values.
3) Link the spatial organization of the repurposed lands with external spatial elements. The key external spatial elements to be considered for linking the surrounding (external) lands to the former mine lands are (i) infrastructure and transport (roads, railways, canals, transmission lines, pipelines, conveyor belts); (ii) agricultural areas; (iii) natural habitats and forests; (iv) residential areas; (v) industrial and commercial zones, business parks; and (vi) generally equivalent land use

patterns.

4) Mainstream environmental and social sustainability criteria into the process. This would entail locating e.g. high impact utilization types in zones that are removed from sensitive receptors such as human settlements, natural habitats, water courses, aquifers. It could mean to locate industries with low environmental sensitivity on areas that already have environmental liabilities. And it also could mean the provision of space for sustainable environmental management practices. An important sustainability element would also be the dedication of significant areas for renewable energy production and storage or carbon capture. Overall the land repurposing methodology's approach is largely consistent with current ES global standards for mine closure and pollution management, as expressed through e.g. the World Bank's ES Framework (ESF).
5) Retain a spatial reserve for flexible future use. This could become highly beneficial as offset or compensation areas for development projects in the region (e.g. land for afforestation to compensate for greenfield developments).
6) Present successive drafts of land and resource management plan (LRMP) to all involved stakeholders. Continuous stakeholder engagement is a crucial element of the spatial planning process and an important determining factor in the quality and sustainability of the final product. Such drafts being based on the above solid and fact-based methodology, will better support a convergence of stakeholder views, reduce subjectivity in planning and help prevent sub-optimal for future land uses.
7) Finalize and implement the LRMP. The finalized spatial plan represents a spatial organization of lands that should allow the rapid development and implementation of utilization scenarios that are compatible with the designated zones and categories. Ideally, to function as an enabling vehicle to crowd in economic activity and development, the plan needs to be legally underpinned, including general land use and environmental permitting for specific zones, based on a general ESIA for the spatial plan, per above.

Regulatory Support for Land Repurposing

To achieve a more supportive regulatory environment, planning and permitting need to go hand in hand at different levels and regional scales: Obtaining higher level permits for larger areas and a generic range of uses would establish pre-clearance for certain uses and related aspects of environmental assessment and management, which would not need to be repeated at lower / more specific permitting levels. The below steps are a practical approach to achieve this:

1. A large portfolio of lands and assets could be covered by a regional spatial plan that would link the post-transition lands to their surroundings. On the environmental permitting level, a Strategic Environmental Assessment (SEA) would be produced, which would define the permissible land uses, delineated into zones with defined typologies of utilization (e.g. renewable energy, forests, biomass production, commercial, business, research, industry etc.), investigate the environmental impacts associated with repurposing options and lay out basic rules and requirements for impact assessment and management.
2. Every such "defined permissible land use zone" would be covered by an individual environmental assessment, which would be the basis for a permit for this zone, for the specified types of use, and covering e.g. all aspects connected to land and natural resources in this zone. It also can serve as a due diligence instrument for potential investors, reducing unanticipated risk related to lands properties.
3. Finally, a specific investment on a single plot within this zone would only require a simplified environmental assessment and / or a management plan (such as e.g. relating to water use, waste

/ sewage management, occupational health and safety, fire safety etc.), which would be a basis for an operational permit.

The Figure below illustrates the approach on an exemplary location earmarked for transition.

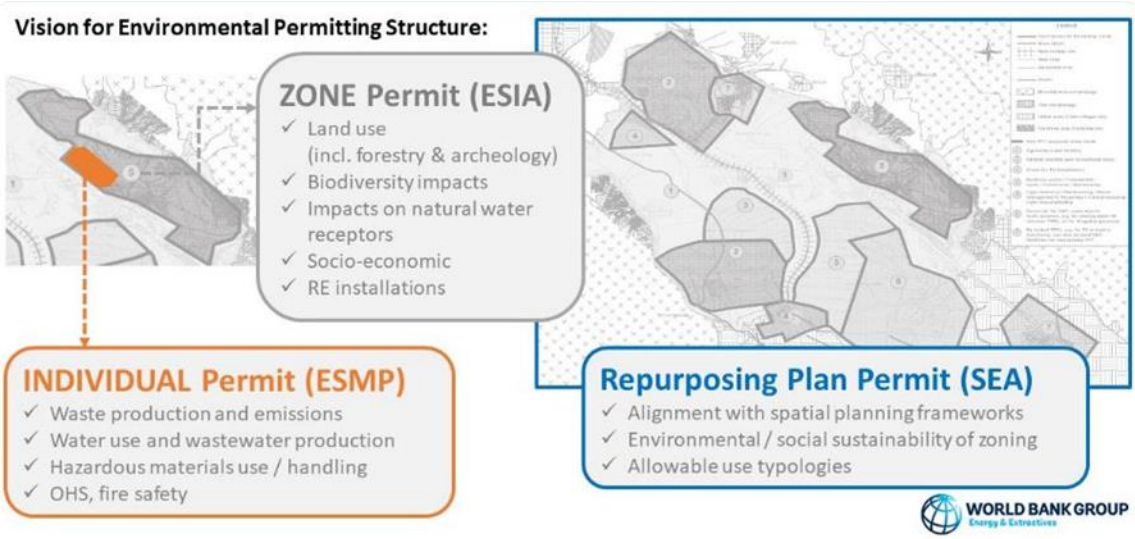

Figure 5: Zoning and permitting approach following LRM application to Lignite mine in W' Macedonia

Application of the Polluter Pays Principle (PPP): The principle of the PPP is that where the mine operator or owner ("polluter") has not abandoned the asset, all legally required measures will be taken under the polluter-pays-principle. If the asset has been abandoned, interim public investment may be needed where the state may be required to retain management and responsibility for the more badly degraded lands or asset, while new (incoming) private sector investments re-purpose select sub-parcels of land or assets from the overall inventory. This would be justified by the assumption that new investment into partially remediated and re-permitted assets creates the economic activity necessary to sustain tax and other revenue streams that could continue to address legacy pollution issues. Public sector management, in lieu of full remediation, may also be required where investment-need exceeds currently available funds, in which case basic remediation and aftercare would be deemed sufficient until new private sector investment can be secured.

One of the potential practical complexities for the planning and financing of land repurposing is the determination of scope and applicability of the Polluter Pays Principle (PPP), and conversely the differentiation between (i) hard PPP requirements and (ii) additional measures for repurposing to exploit lands' full development opportunities. To address this, propose the below criteria are proposed. While they are neither exhaustive, nor draw a sharp boundary for the operators' obligations under the PPP, they may be useful as guiding criteria to be applied on a case by case basis:

PPP – hard requirements

- Compliance with environmental permits regarding reclamation / remediation
- Prevention of risks and hazards to public health and safety

Additional Measures for Land Repurposing

- Grading, conditioning, compaction or landscaping to allow installation of structures (e.g. roads, PV, wind turbines…)
- Provision of extended access and utilities

- Safe and stable surfaces (slopes, waste tips, subsidence, residual lakes…) and drainage
- Prevent pollution of valued environmental components: air (methane leakage, dust); (ground)water (pumped waters, ARD, leakage into aquifers); land (ore, processed products, fuels, lubricates, chemicals)
- Securing of underground works (plugging, backfilling, flooding)
- Securing of built assets: demolition / removal or conservation
- Access for required aftercare activities (controls, sampling, surveys) as well as safety (e.g. fire roads)

- Extensive reshaping and relocation of materials for purposes other than stability and safety (physical and chemical), e.g. for landscaping / aesthetic purposes, or to prepare for investments.
- Upgrading of lands to natural habitats (or planting of high value vegetation, e.g. energy crops, unless prescribed in the environmental permits)
- Parceling and preparation for investment, e.g. business, industrial or recreational parks
- Improving connectivity with external infrastructure, such as access to the area / site, electrical grid, utilities etc.

An additional set of questions relevant and helpful for the delineation of PPP would also be:

(i) What has been agreed during the operational period under the mining license?
(ii) What is acceptable under the circumstances?
(iii) What is proportionate in terms of cost / benefit?

Some thoughts on these: very few mines will leave a landscape that is equivalent to pre-operation. Hence the generic term "restoration to original condition" – often found in environmental permits - will hardly ever be achievable in practical terms and, moreover, may not be the best option to attract investment. Hence, it should not be used as a benchmark to delineate PPP from additional measures. There should be an acceptance that some areas will not be usable for any construction for the foreseeable future due to long term impacts, e.g. subsidence or settlements. Other areas may be much less affected and would hence be available to immediate "upcycling" and repurposing. A special case are situations with high geogenic concentrations of pollutants in soils or groundwater (e.g. heavy metals or arsenic) which obviously would need be excluded from the operators' responsibilities and liabilities.

The land assessment and repurposing methodology provides valuable guidance in the context of PPP discussions. It differentiates lands into categories along optimized repurposing scenarios. It avoids sinking large amounts of money into repurposing highly degraded lands into sensitive or high value uses (which very likely will not be financeable under the PPP), where more cost-effective alternative locations are available. Instead, for highly degraded lands, basic safety or containment measures would be implemented, while "upcycling" would be reserved for lands that come with high development potential and high potential added value combined with low repurposing cost. There still may be a margin between what the "polluter" would have to pay under PPP, and the repurposing cost, but the goal would be to minimize this differential and thus optimize the financing needs for land repurposing."

Facilitation of Transition Through a Special Purpose Vehicle

Should a holistic approach — using the land repurposing methodology and linking it to existing spatial plans covering the project area and surroundings — be pursued, there is ample precedent in other post-mining transitions[3] to consider forming a Special Purpose Entity (SPE). An SPE could be an entity created with participation of all key players around a large transition project including closure, remediation, repurposing and economic regeneration. Former operators could be major shareholders of an SPE, as well

[3] United States, Germany, China, to name but a few.

as regional Government, affected municipalities, land developers, financing agencies and others. An advisory or steering committee could include additional stakeholders from the NGO/CSO scope, academia, specialized agencies and EU / international organizations.

An SPE could be given a varied scope of potential mandates, which are listed as a menu of options in the figure below.

Figure 6: Typical menu of possible SPE mandates.

The SPE would also have an important role as a "moderator" of discussions around design and implementation of spatial plans and the LRM, curate information, manage a continuous stakeholder dialogue, review information stored in LRM databases and request updates as needed, and present / utilize / promote LRM in key meetings and decision-making processes. Separate case studies and guidance on SPEs in the context of coal transition are available [reference to our notes once they are published?].