MODERNISATION:

TAKING THE MINING CLUSTER INTO THE FUTURE

Modernisation

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The Chamber and its partners made significant progress towards modernisation in 2017. From the Mining Phakisa of 2015 (a year of advocacy) to formulation in 2016 when needs were identified and structures, relationships and programmes were established, action was taken in the past year to pave the way for delivery in 2018.

CAPTION
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2030 MINING INNOVATION ROADMAP

- **Completed research into key technical innovation and change-related trends**

  Research into 36 major technological, social and human trends was completed, identifying 'flags' to be noted by the mining cluster for operations and host communities.

- **Developed long-term innovation roadmaps describing potential future states**

Six broad thematic areas will be affected by the overarching mining modernisation process:

1. Skills development for future employment

2. Rural and mining community development

3. Local procurement

4. Health and safety

5. The environment

6. People-centred technology

Each of these areas will be affected differently by various long-term trends, commodities and geographies, for example, Emalahleni and Rustenburg face different futures. Trends have therefore been applied to each thematic area to understand risks and to present specific interventions (including 2018 modernisation pilot projects) to mitigate the risks.

MINING INNOVATION ECOSYSTEM

- **Research into leading global practices for collaboration in innovation at cluster level**

  While every innovation ecosystem around the world is unique, common factors, which generally underpin success, have been identified. Extensive research and engagement with organisations within and outside South Africa were conducted to this end.

  The research has produced a series of recommended characteristics for the development of a South African mining innovation ecosystem. The factors are being incorporated into the Mining Precinct @ Carlow Road.

- **Evaluated capabilities of the South African research environment**

  The capabilities of all universities, research councils and commissions, specialised research organisations and any other relevant publicly funded agencies were mapped across South Africa so that these institutions can collaborate effectively with the mining cluster.

  The study produced a matrix, which describes the research activities, competency and performance of all these institutions.

- **Hosted participatory dialogues between members of the mining cluster to promote collaboration and build relationships across sectors**

- **Six major events were organised for various sectors of the mining cluster to develop specific content for use in various projects and to build cross-cluster relationships. The events included:**
  - Trends and the future state of mining
  - The future mine in practice
  - Mining Equipment Manufacturers of South Africa (MEMSA) technology ideation workshop
  - Mine.D Zero Harm Hackathon
  - The future of mining through the employee's eyes
  - Platinum industry technology ideation workshop

Participants included executives, managers and operational staff in industry, government departments and agencies, original equipment manufacturers (OEMs), suppliers, unions, communities and academia.

MINING PRECINCT @ CARLOW ROAD

Among the major achievements in 2017, the first year phase, was the establishment of the Mining Precinct @ Carlow Road. The premises, provided by the Department of Science and Technology in 2016, is ideally located for innovative research and development (R&D). Some 60 occupants, ranging from interns to programme managers and directors, now work in this Mining Precinct – and more are expected in the coming year.

The Mining Precinct operates in terms of a hub-and-spoke model:

- At the 'hub' is a co-ordinating centre, which manages the facility and co-ordinates the flow of R&D activity between the precinct, participating universities, the Council for Scientific and Industrial Research (CSIR), MEMSA and other stakeholders, including the Department of Science and Technology, the Department of Trade and Industry and the Office of the Phakisa Secretariat. Associated with MEMSA, the South African Capital Equipment Export Council is also in the hub, together with various other professional societies such as the Mine Ventilation Society of South Africa and the Geological Society of South Africa.
- Mining companies and their operations as well as research institutions are the 'spokes'. Some researchers reside within the Mining Precinct.

The variety of organisations operating within the hub illustrates its collaborative nature, which is in line with the agreed public-private partnership (PPP) approach. The CSIR is the 'incubator' in this PPP, which performed successfully throughout 2017.

In 2016, National Treasury allocated R150 million for the hub to conduct mining R&D over a period of three years: R27 million for 2017/8, R63 million for 2018/19 and R60 million for 2019/20. National Treasury has pledged another R63 million for 2020/21 and possibly more when project delivery is evident.

The Chamber Council co-invested R1 for every R2 from government, in addition to each company's investment, in 2017.

Delays in the transfer of government funds delayed some programmes in 2017 but this challenge had been resolved by year end. Significant collaborative, ground-breaking agreements were established with the CSIR, the University of the Witwatersrand, the University of Pretoria and the University of Johannesburg. Memoranda of understanding (MoUs) are being formulated to include the Mine Health and Safety Council, the Mining Qualifications Authority (MQA), the Tshimologong Digital Innovation Precinct and various commercial partnerships.

The Chamber and its members participate actively in the Mining Precinct, managing the programmes through established steering committees and the innovation team, which includes senior technical executives who guide and advise participants.

Achievements in 2017 included enabling researchers and interns to monitor and analyse the performance of new mining equipment on testing sites. The information thus gathered was disseminated and communicated to all participating members. The collective R&D strengths of the researchers, industry and MEMSA could then be leveraged for the benefit of all.

At the end of 2017, an additional development was the agreement with a team of eminent industry executives and researchers to form a mentorship and advisory group that would nurture researchers and advise on research programme delivery.

Six programmes were set in motion in 2017:

- Advanced orebody knowledge
- Longevity of current mines
- Mechanisation of gold and platinum group metal (PGM) mines
- Non-explosive rock breaking
- Real time information management systems
- Successful application of technology map

The programmes have been designed to fast track baselines and identify areas in need of research, assisted by mining companies prepared to share experiences and sites to avoid the duplication of efforts in realising short-, medium- and long-term deliverables.

Short-term deliverables aim to deliver 'quick wins' with the longevity of current mines in mind: 34 emerging technologies are being evaluated – 10 focusing on new stope drilling equipment, five on ore reserve development, eight on stope cleaning, four on support systems, three on blasting and four on transport.

More fundamental programmes, such as the non-explosive rock-breaking programme, may require immediate fundamental research and longer-term development, based on their levels of technological readiness.

MODERNISATION continued

A particularly important programme is SATMAP, which deals with 'people issues'. As stakeholder involvement is particularly important in this programme, in 2017 a number of bilateral discussions were held with organised labour, including Solidarity, UASA, NUM and AMCU. In all cases, engagements were positive and it was unanimously agreed that modernisation is inevitable however with the caution: 'do nothing about us without us'. A strong platform for progression towards real stakeholder engagement has thus been established for the benefit of all.

Clearly, the primary focus of the Mining Precinct and hub is on R&D delivery for the modernisation of the mining industry. However, the occupants have identified a need to increase the scope of activities to include other areas essential for modernisation, including community development, local industrialisation, development of agri-business on mine properties, water and energy use, skills development and value chain optimisation.

Ideation sessions

To facilitate further collaboration and to stimulate ideas, new innovative processes have been introduced in the Mining Precinct, including a series of cascaded 'ideation' sessions.

Critical questions are presented in these sessions to stimulate discussions about innovative solutions. Discussions have included the integration of people, processes and technologies to create an order of magnitude improvement in productivity for the PGM sector. Sessions begin with high-level strategically-focused workshops followed by a series of sessions including management and OEMs.

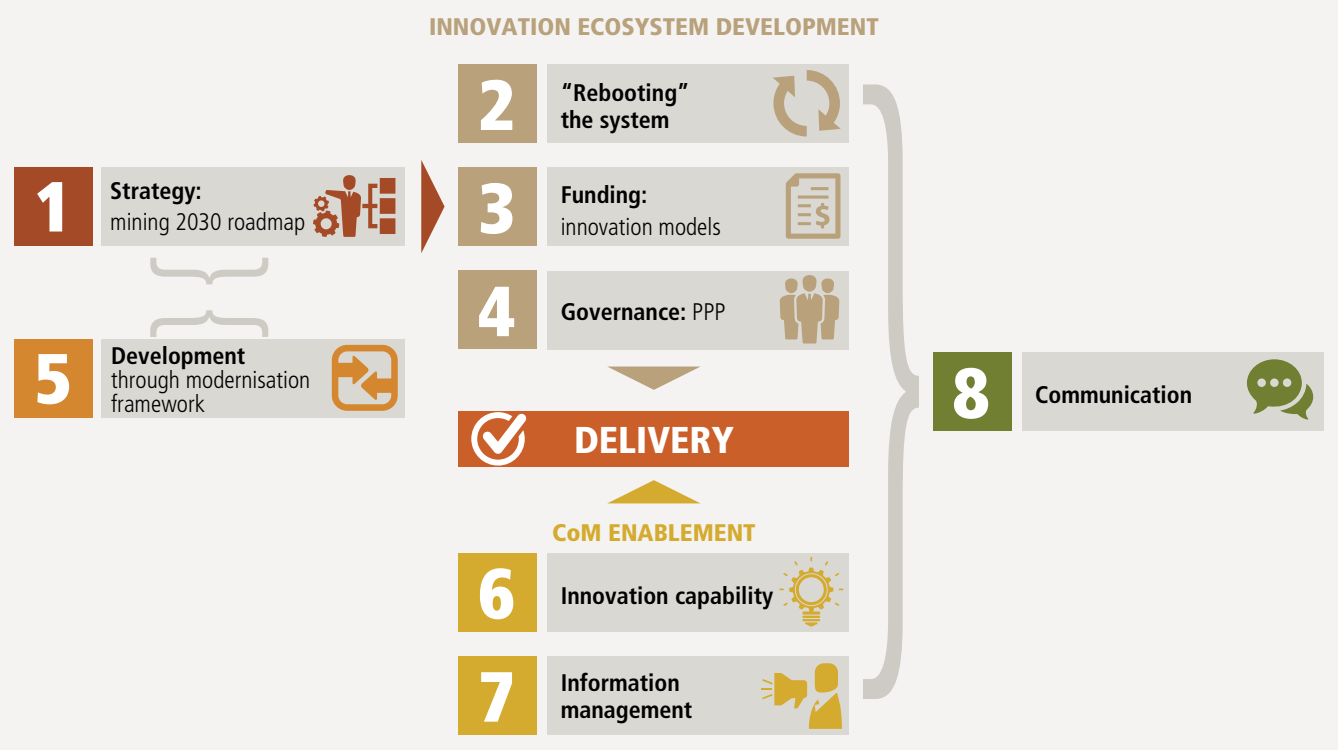
CAPTION

AngloGold Ashanti – Mponeng

MINING 2030

Chamber Vice-President, Neal Froneman, in a presentation at the Mining Indaba in February 2017, said: "To be successful, introducing technology will need to be addressed in a holistic manner, adopting a systems and people-centric approach".

To give effect to a holistic approach to innovation the Chamber decided, as part of its annual strategic review, to develop an 'innovation-focused' strategy. The framework for this strategy is in the diagram below.



INNOVATION ECOSYSTEM DEVELOPMENT

The priorities for 2018 include:

- **Mining Modernisation Framework:** A framework is needed to inform mines and host communities about the complexities and risks associated with modernisation efforts required for mining to remain a sustainable economic activity into the future. Trends identified and scenario development completed in 2017 will be used in developing this framework, which will help each operation establish a long-term roadmap and plan of action. It will be applied initially in the Mpumalanga coal region.
- **Support for social and technology-based entrepreneurs:** A mechanism that will enable establishment and growth of businesses in the mining cluster is needed. The financial and human resources of national and industry stakeholders will have to be leveraged, and mining-specific innovation incubation and acceleration guidelines will have to be developed.
- **Modernisation of MOSH Learning Hub:** To enable the hub to share innovative leading practices, and in support of its change management role, capabilities must be modernised. New technologies, which prevent vehicle-related incidents and fatalities (advanced proximity detection systems, among others) can lead to step changes in the health and safety performance of mining operations.
- **One conformant blast per day:** To support this achievement, innovation, such as new drilling technologies, and human resource development are necessary. Electrohydraulic drills, improved drill positioning technologies, incorporation of composite materials into drills to reduce carry weight and integration of internet of things ('smart' technology) applications into the drilling cycle are among the innovative solutions.