- Mining Sector Reform –
a Holistic Approach and Worldwide Experiences

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Astana, Kazakhstan
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• GAF short introduction

• Mining Sector Consultancy - an Overview –

• GAF Experiences in Mining Sector Reform Projects
Company name: GAF AG
CEO: Dr. Peter Volk
COO: Dr. Stefan Saradeth
Type of business: Geo-Information Solutions
Quality system: DIN EN ISO 9001:2008
Years in business: since 1985
Staff: ~ 200
Contact: info@gaf.de; www.gaf.de
An integrated Approach

Integrated Product & Service Portfolio

- Geo-Data
- Pre-processing
- Image Processing
- GIS/IT Applications
- Application Specific Adaptation
- Organisational Realization
- Data Reception
- Consulting
- Geo-Products
- Technical Services
- Software Products
Services

- Geo-Data Store
- Data Processing
Services

- **Information Systems**
  - System analysis, integration and migration
  - GIS/DB design and implementation
  - Application development
  - Spatial data structure concepts

- **Software Development**
• **Integrated Services**
  - Combining space & non-space technologies
  - Integration of SatCom, SatNav and EO
  - Application knowhow based on cutting edge technologies and high quality data resources

• **Management Consulting**
  - Institutional/sector assessment
  - Know-how transfer and capacity building
  - Project implementation
  - Project definition and supervision
  - Research and sector analysis studies
  - >25 years experience and world wide activities
Applications Fields

Agriculture

Environment

Forestry

Land Management
Applications

Geology/Mining/Oil&Gas

Infrastructure

Security

Water
• **International Institutions**
  – EU, ESA, EEA, FAO, IFAD, UN and UN Programmes,...

• **International Development Banks**
  – African Dev. Bank, Asian Dev. Bank, EIB, EuropeAid, Inter-American Dev. Bank, World Bank, ...and numerous intl. ministries and Agencies

• **National Authorities and Organisations**
  – Germany: KfW, GTZ, GIZ, Federal institutes and research centres (BGR, StaBA, DLR, GFZ), Federal armed forces
  – Various national ministries of agriculture, forestry, mines, environment and transportation worldwide

• **Private Sector**
  – Consulting, Mining, Construction, Telecommunication...
Realised Projects International

>100 Countries and >500 Projects

...using a wide network of local partners and consultants
Mining Sector Consultancy
- an Overview -

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Supply side

• Many countries in the world have favorable geologic conditions for economic mineral and hydrocarbon development but lack in the institutional, administrative and technical capacities to manage such resources.

• One major policy of governments and international donor organizations is to identify and implement programmes necessary to foster this sector on an efficient and sustainable basis in order to make countries attractive for international mineral and hydrocarbon exploration and development.

Demand side

The developed countries and emerging nations have an increasing demand in raw materials and more and more difficulties to cover this at reasonable costs.

Reasons:

• Concentration of the suppliers
• Export regulations
• State investments
• Long site development of new deposits and reservoirs
• Critical political situations in some supply countries

Development of raw material initiatives (Germany, EU) with the goal to create more reliable supply of raw materials
General objectives of the institutional strengthening of the mining sector

- Transformation of the raw materials wealth into a continuous and constant source of income for the government and the society

- Central point of all initiatives is the improvement of the political, ecological, economic and social framework conditions

- "good governance" and transparency in the mining sector

- Introduction and implementation of international rules, standards and best practices

- Establishment of a sustainable and reliable legal and administrative framework

- Transformation of the Government’s role from operator to regulator, facilitator and supervisor of mining activity, leaving the operational and implementation role to the private sector
Investor’s Expectations

• Sustainable and reliable legal and administrative framework conditions
  – State-of-the-art mining code
  – Competitive taxes and royalties
  – Secure tenure and investment

• Good governance and transparency
  – Swift administrative services
  – Investor security
  – Competent and trained staff in mining administrations

• Geo-data Infrastructure
  – Maps and spatial data (e.g. geological-, mineral potential, hydro maps)
  – Reports and data from previous exploration activities
  – Organized geo-data archive or/and mineral/hydrocarbon information system
Typical Components

Essential Components of Mining Sector Projects (e.g. WB, EU, national)

1. **Mining Code / -Regulations:** Establishment of a legal, regulative, fiscal and political framework towards international best-practice

2. **Mining Cadastre:** Establishment of an effective, transparent and computerized (also Web-based) mining cadastre on the basis of the mining regulations

3. **Mine Inspectorate:** Institutional set-up of typical mine inspectorate functions
   - Mine-Compliance Monitoring (Inspectorate)
   - Environmental Monitoring
   - ASM: Institutional strengthening concerning legal, regulative and operational aspects of ASM
   - HSE (Health & Safety)
   - Etc.

4. **Geo-data:** Set-up and improvement of the Geo-data infrastructure:
   - Geological Mapping with all facets for the provision of geological base information
   - Mineral/hydrocarbon information system: Preparation and provision of available Geo-data via a GIS respectively Web-GIS

5. **Promotion**
   - Participation in international mining conferences and exhibitions
   - Promotion material
The establishment of modern and effective institutional and administrative structures in the mining sector is an important step forward:

- Increasing attractiveness for international investors
- Provision of fresh or reprocessed information for Juniors and Multinationals

Win-win situation for both sides

Advantages for Investors
- Improved access to new raw material resources
- Increased investment security
- Improved geo-data infrastructure
- Transparent processes
- Educated and trained staff in the mining administrations

Advantages for the concerned countries
- Improvement of the economic, ecological and social framework
- Transformation of the raw materials wealth into a continuous and constant source of income for the government and the society
- Diversifying of the economics (e.g. Generation of „non-Farm“ income)
Before and ...
Practical Experiences in Mining Sector Projects

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Mineral Sector Projects at GAF (last 5 years only)

**Geological Mapping**
- Madagascar (WB, with partner BGR)
- Morocco (ntl.)
- Uganda (WB / NDF)
- Sudan (ntl.)
- Cote d’Ivoire/Ghana (BGR)

**Mineral/Geological/Hydrocarbon Information Systems**
- Mauritania (WB)
- Madagascar (WB)
- Papua New Guinea (EU)

**Mineral/Hydrocarbon Cadastres**
- Nigeria (WB)
- Mongolia (WB)
- Afghanistan (WB)
- British Guyana (ntl.)

**Setting-up of a Mines/Hydrocarbon Inspectorate, HSE and artisanal mgt.functions**
- Afghanistan (WB)
- British Guyana (ntl.)

Further references in Namibia, RDC, Tunisia, Egypt, Algeria, Oman, Spain, Romania, Greenland, Burkina, Botswana, Yemen, Brazil
GAF Portfolio in the Mining Sector

**Portfolio:**
- Institutional Strengthening & Capacity Building
- Geological Mapping / Exploration
- Geological Information systems
- Mines – Oil & Gas Information systems
- Implementation of Mining Cadastres
- Implementation of Mine Inspectorates
- Environmental Monitoring

**Clients:**
- Ministries of Mines
- Ministries of Oil & Gas
- Geological surveys
- Mining Industry
- Oil & Gas Industry
GAF Resources (example for service provider)

Resources and Advantages

- Overall 180 GAF staff headquartered in Munich
- 12 Geologists & Mining Engineers, 2 Geophysicists
- Close Co-operation with Geol. Surveys and Industry groups
- Large Technical Staff (>50 in GIS, IT etc.)
- Large Freelancer Pool (>400), 30 from Africa
- Always including local expertise
- Easy access to in-house expertise in other neighbouring geo-sciences (geography, environment, soil, water etc. >75 staff)
- Close in-house co-operation of Geo-scientists and Software Developers and IT experts
- Usage of latest technology developments
- Philosophy: professional consultancy services to enable full know-how transfer and capacity building
- Integrated Quality Management in every project
- Reliable service delivery and keeping deadlines, no vested interests (mining industry)
Cadastre/Inspectorate Afghanistan

Establishment of of Cadastre, Inspectorate, Audit and Licensing Functions in the Ministry of Mines, Afghanistan

Overview:

• Client: Ministry of Mines – Kabul
• Topics: Mining Cadastre and Inspectorate
• Partners: Sofreco (F), CGS (CZ)
• Project in a nutshell:
  – ~ 6 Mio. €
  – 4 years, start 2008
  – > 210 MM int‘l experts; 4 permanent
  – ~320 MM local staff
Project Targets and Activities:

1. Review of and contribution to legal frame work
2. Institutional reorganisation within the Ministry:
   - set-up of a cadastre department and inspectorate department
   - Staffing profile and selection
3. Design and implementation of business processes for both departments
4. Development of computerised mining and hydrocarbon cadastre
5. Regularisation of the mining rights
6. Support operation of the mining and hydrocarbon cadastre department
7. Training - workshops – field trips study tours – preparation of handbooks
8. Development of a „mock-mine“ for training purposes
Overview:

- Client: Ministry of Mines – Kabul
- Topics:
  - Contract Compliance Monitoring of Aynak Copper Mine
  - Capacity Building within Ministry
- Scope: ~ 2,5 Mio. €, 2 years
- Providing:
  - Environmental Expertise
  - Social Expertise
  - Mine Planning and Development Expertise
  - Metallurgical Expertise
  - Geological Expertise
Overview:

- Application of satellite data and inspectorate information to detect and monitor informal mining activities
- End User: Ministry of Mines (MoM) of the Islamic Republic of Afghanistan
- Other Potential End Users:
  - Geological Surveys
  - Ministries of Mines
  - Environmental Protection Agencies
  - Extractive Industries
  - Law Enforcement Agencies
- Funding: ESA/ESRIN
- Partners:
  - Lead GAF, Germany
  - German Aerospace Centre, Germany
  - Institute for Environmental Security, Netherlands
  - Bonn International Center for Conversion
Project Activities:

- High resolution imagery, to detect mining operations
- Stereo imagery, to estimate material extracted
- Ancillary data, e.g. topographic and/or geological enhancing the EO Data
- Special processed radar data enabling to distinguish between:
  - Active and non-active operations
  - Possible transportation routes
  - Informal border crossings
- Multitemporal data to monitor development
Law Enforcement

Cartosat-1 IRS-P5 Orthoimage with manually mapped tracks (red) and quarries (green)

CosmoSkymed coherence image 08.-12.11.12, note clearly decorrelated track leading NW -> Main route?

CosmoSkymed coherence image with manually mapped active tracks (green)

Orthoimage showing active and non-active tracks
Geological Mapping of Madagascar – at best intl. level

1. Data Compilation
   - Earth Observation Data
   - Geophysics
   - Existing Geological Maps and Reports
2. Geological Field Mapping
3. Analysis of Stream Sediments
4. Analysis of Geochemistry and Geochronology
5. Rock- und Ore Petrography
6. Geo-tectonic Interpretation
7. Cartography and Reporting
8. Training and Know-how Transfer
Geological Mapping of Madagascar

Zone A+B  BGS/USGS
British Geological Survey/United States Geological Survey

Zone C  GAF/BGR
GAF AG/Federal Institute for Geosciences and Natural Resources

Zone C Zentrum  (1:500,000):  129.388 Km²
Zone C West  (1:100,000):  8.730 Km²
Zone C Osten  (1:100,000):  13.693 Km²
Im Vergleich:  Deutschland:  357.092,90 Km²

Zone D  BRGM
Bureau des Recherches Géologiques et Minières

Zone E + F  CGS
Council of Geosciences South Africa
Modern Geological Cartography....

Top: 100k geologic map
Top left: 200k Stream sediment map
Centre left: 500k Mineralisation and potential map
Bottom left: 500k Structure map
Bottom centre: 500k Hydrogeological map
Bottom right: 500k Geomorphological map
Right: 200k Geologic map of the Vohibory
The project provided institutional advice and technical assistance in order to design and implement a national Geological and Mineral Resources Information System to fulfil three basic operational functions:

- Storing and Retrieving of all exploration relevant data sets
- Production of standardised maps and reports for the support of the mining industry and attracting investments
- Performing customary exploration target generation for a wide range of commodities

Objective was to promote the mining sector in Papua New Guinea by improved use of geological, geochemical, geophysical, remote sensing, environmental, and field/rock analysis data for the rapid delivery of appropriate information products and services, better communication and dissemination and training of staff.
Mineral Information System

Detailed Description of the Services provided:

- Detailed user assessment, procedures analysis, data inventory, and user requirements consolidation
- Design of an appropriate GIS/DB hard- and software infrastructure
- Procurement consulting
- Development of a functional Prototype including a complex webpage for promotion
- System testing, debugging, validation
- Management and quality control of populating the GIS/DB
- Training in operation and maintenance
- Capacity building
- Design, Planning and Monitoring of promotion and dissemination activities
Knowledge Transfer and Training

Focus is „learning on the job“:

Upper left: Topographic survey course in quarry
Middle left: Using GeoRover during field mapping
Lower left: Using modern IT for data collection
Bottom centre: Data management in the office
Bottom right: Petrography course in-house

Ex-cathedra teaching courses are applied for specific purposes, and very basic start level of trainees
There is a long-standing experience in Germany for mining sector consultancy by:

- BGR – Federal Institute for Geosciences and Natural Resources
- Consultancy Companies like GAF
Thank you for your attention!

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