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Leibniz Institute of Ecological Urban and Regional Development

in cooperation with

The Institute of Environment and Automation

27.06. – 01.07.2016 | Dresden | Germany

CONFERENCE DOCUMENTATION

MAREX

Management of Mineral Resource Extraction in Hoa Binh Province – A Contribution to Sustainable Development in Vietnam

www.marex-project.de

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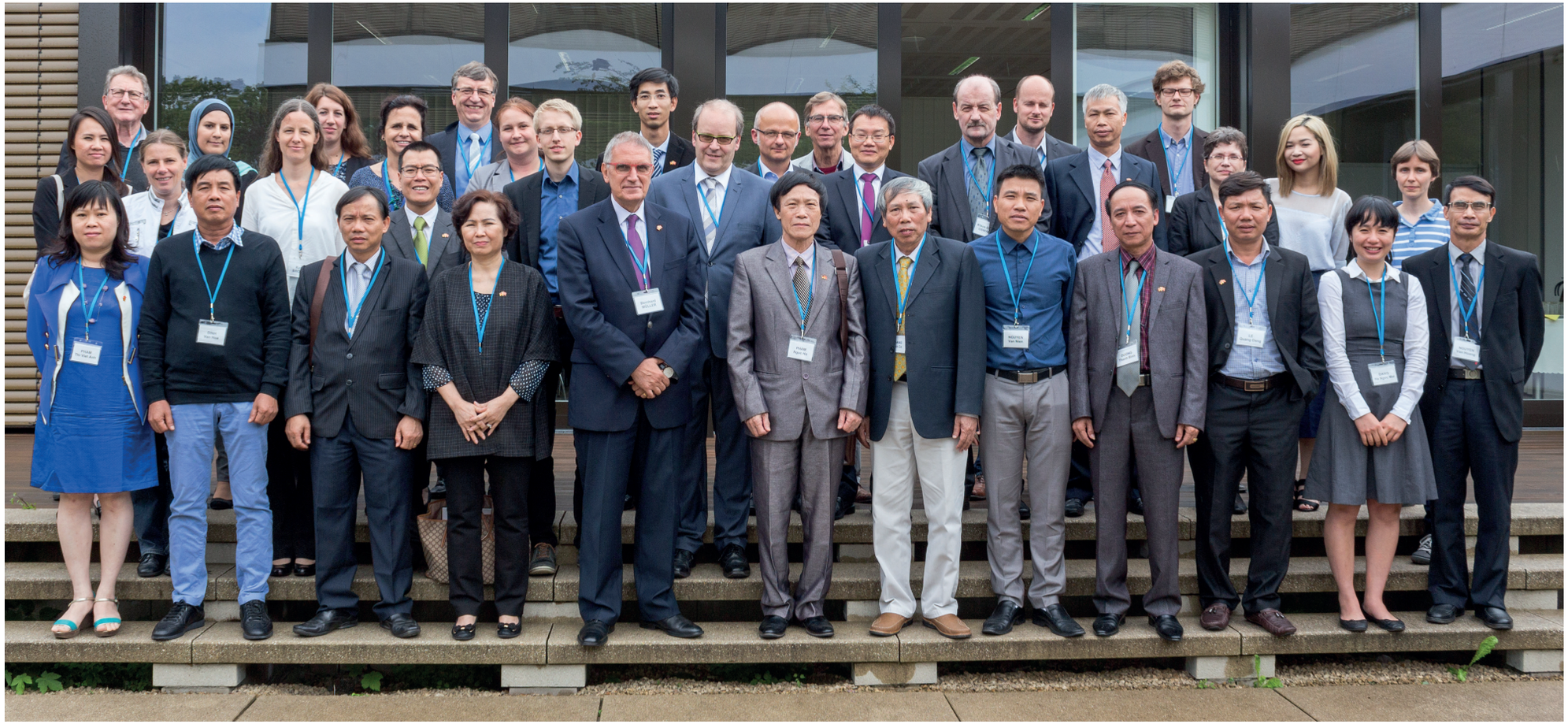


Participants of the MAREX Kick-off Conference in Dresden 28 June 2016

Prof. Dr. Bernhard Müller

German project Leader | Director of the Leibniz Institute of Ecological Urban and Regional development

The MAREX approach – an introduction

Cities in Vietnam are growing. Residential and commercial buildings are rapidly being constructed in the capital Hanoi and other urban regions. Furthermore, transportation infrastructure is expanding. This puts pressure on mining industries in the surrounding provinces to meet the huge demand for building materials, especially gravel and sand. Extraction activities are discernibly changing the shape of the landscape, while natural resources – air, water and soils – are becoming polluted. Urban expansion is also fostering conflict in land use, for instance between agriculture and nature conservation.

To contribute to the development of strategies for a more sustainable mining in Hoa Binh Province, the German-Vietnamese cooperation project MAREX (Management of Mineral Resource Extraction in Hoa Binh) was launched in 2015. The German research consortium consists of the Leibniz Institute of Ecological Urban and Regional Development (IOER) in Dresden as project coordinator, the TU Dresden, the TU Dortmund and the company C&E Consulting & Engineering GmbH in Chemnitz. A close research cooperation connects the German partners with the Institute of Environment and Automation and the VNU Vietnamese National University of Science in Hanoi.

Within the scope of the MAREX project, the consortium promotes (1) the monitoring of mining activities and related environmental problems, (2) cleaner production technologies in the Vietnamese stone and quarry industry, (3) the implementation of material flux analyses and (4) the establishment of a cooperation and communication platform between governmental institutions and enterprises.

This platform, called the MAREX Alliance, was set up as a result of the recent MAREX kick-off conference week in Dresden from 27 June to 1 July 2016. The core elements of the cooperation structure were laid out in a joint declaration and signed by the research partners in Germany and Vietnam as well by the representatives of Hoa Binh Government and the provincial stone and quarry industry.

The following documentation presents the scientific contributions of the German kick-off conference, including the field trips and the MAREX Alliance Declaration.

Welcoming Addresses were held by

Prof. Dr. Pham Ngoc Ho

The Institute of Environment and Automation (IEA), Ha Noi

Bui Van Khanh

Vice Chairman of Peoples´ Commitee of Hoa Binh Province

Dr. Lothar Mennicken

German Federal Ministry of Education and Research

M.A. Cu Viet Ha

Vietnamese Ministry of Science and Technology (MOST)

Abstract / Presentation
download link: http://www.marex-project.de/events.html

MAREX-Allianz

Die Teilnehmer des Deutsch-Vietnamesischen Workshops „Management der Gewinnung mineralischer Ressourcen in der Provinz Hoa Binh – Ein Beitrag zur nachhaltigen Entwicklung in Vietnam" vom 27.6.-1.1.2016 in Dresden kommen zu folgendem Ergebnis:

Im Rahmen des Projekts MAREX wird die **MAREX-Allianz** gebildet.

An der MAREX-Allianz sind folgende Partner beteiligt:

- Regierung der Provinz Hoa Binh
- Unternehmen der Baurohstoffgewinnung der Provinz Hoa Binh

Weitere Einrichtungen können als Partner beteiligt werden.

Die MAREX-Allianz wird im Department of Natural Resources and Environment (DoNRE) der Provinz Hoa Binh in Zusammenarbeit mit dem Institute of Environment and Automation (IEA) koordiniert.

Während der Laufzeit des Projekts MAREX wird die MAREX-Allianz vom deutschen MAREX-Projektkonsortium unter Leitung des Leibniz-Instituts für ökologische Raumentwicklung (IÖR) inhaltlich und organisatorisch unterstützt.

Die MAREX-Allianz hat ausschließlich konsultativen Charakter und dient der Beratung der Provinzregierung und der Baurohstoffe abbauenden Betriebe von Hoa Binh. Beschlüsse werden einstimmig gefasst.

Wesentliches Ziel der MAREX-Allianz ist die Förderung eines nachhaltigen Managements der Gewinnung von Baurohstoffen in der Provinz Hoa Binh unter Berücksichtigung aller vom Bergbau betroffenen Interessen.

Zur Erfüllung seiner Ziele führt die MAREX-Allianz folgende Maßnahmen in der Provinz Hoa Binh durch:

- Jahreskonferenz zum nachhaltigen Management der Gewinnung von Baurohstoffen
- Seminare zu wichtigen grundsätzlichen oder aktuellen Themen, zum Beispiel zum Umweltmonitoring (2016), zu Abbauplanung und -kontrolle sowie Cleaner Production (2017), sowie zu Regionalplanung, Interessenausgleich und Nachfolgenutzungen (2018)
- Weitere Workshops und Trainingsmaßnahmen nach Vereinbarung
- Aufbereitung von Informationen für Unternehmen, Politik, Verwaltung und weitere Stakeholder.

Weitere Maßnahmen können auf Beschluss der Partner durchgeführt werden.

Dresden, 1. Juli 2016

Für die Teilnehmer des Workshops (vollständige Liste im Anhang):

Bui Van Khanh, Stellvertretender Vorsitzender der Regierung der Provinz Hoa Binh

Duong Thanh Binh, Stellvertretender Direktor, Trung Son Zementfabrik, Hoa Binh

Prof. Dr. Pham Ngoc Ho, Direktor, Institute of Environment and Automation (IEA)

Prof. Dr. Bernhard Müller, Direktor, Leibniz-Institut für ökologische Raumentwicklung (IÖR)

Hội MAREX

Các thành viên tham gia Hội thảo Việt-Đức về "Quản lý khai thác khoáng sản vật liệu xây dựng tỉnh Hòa Bình – Một đóng góp cho phát triển bền vững ở Việt Nam" từ ngày 27 tháng 6 đến ngày 1 tháng 7 năm 2016 thống nhất:

Thành lập **Hội MAREX** trong khuôn khổ dự án MAREX.

Các thành viên tham gia Hội MAREX gồm có:

- Ủy Ban Nhân Dân Tỉnh Hòa Bình
- Các doanh nghiệp hoạt động trong lĩnh vực khai thác khoáng sản vật liệu xây dựng tại tỉnh Hòa Bình

Các đơn vị khác có thể tham gia với tư cách là đối tác của Sáng kiến.

Hội MAREX được thực hiện với sự phối hợp của Sở Tài Nguyên và Môi Trường tỉnh Hòa Bình (DoNRE) cùng sự hợp tác của Viện Môi trường và tự động hóa (IEA).

Trong quá trình hoạt động của dự án MAREX, Hội MAREX sẽ nhận được sự hỗ trợ về mặt nội dung cũng như tổ chức từ phía tổ hợp đối tác đến từ CHLB Đức của dự án MAREX, dưới sự điều hành của Viện Phát triển không gian sinh thái Leibniz (IOER).

Hội MAREX hoạt động dưới hình thức tư vấn, tham mưu cho Chính quyền Tỉnh cũng như các doanh nghiệp khai thác khoáng sản vật liệu xây dựng tại tỉnh Hòa Bình. Các quyết định của Hội MAREX được thực hiện dưới sự đồng thuận của các bên liên quan.

Mục tiêu chính của Hội MAREX là thúc đẩy quản lý bền vững thông qua việc liên kết các bên liên quan trong lĩnh vực khai thác khoáng sản vật liệu xây dựng tại tỉnh Hòa Bình.

Để đáp ứng các mục tiêu của mình, Hội MAREX sẽ tiến hành thực hiện các hoạt động sau tại tỉnh Hòa Bình:

- Thực hiện Hội nghị thường niên về quản lý khai thác bền vững khoáng sản làm vật liệu xây dựng
- Thực hiện các khóa đào tạo, tập huấn về các vấn đề quan trọng và cấp thiết, ví dụ như Quan trắc môi trường (năm 2016); Quy hoạch khai thác khoáng sản; Công nghệ kiểm soát và sản xuất sạch hơn (năm 2017); Quy hoạch vùng, dung hòa lợi ích các bên liên quan và tái sử dụng đất sau khi đóng mỏ (2018).
- Thực hiện các Hội thảo và các chương trình tập huấn khác theo nhu cầu và thỏa thuận
- Chuẩn bị và cung cấp thông tin cho các doanh nghiệp, chính quyền, các đơn vị quản lý nhà nước, cũng như các bên có liên quan.

Ngoài ra, các hoạt động quan trọng khác có thể được thực hiện dưới sự đồng thuận của các đối tác.

Dresden, ngày 1 tháng 7 năm 2016

Đại diện các thành viên tham gia Hội thảo: (Danh sách đầy đủ có trong Phụ lục)

Ông Bùi Văn Khánh, Phó Chủ tịch Ủy ban Nhân dân Tỉnh Hòa Bình

Ông Dương Thanh Bình, Phó Giám đốc Công ty Xi măng Trung Sơn, Hòa Bình

GS.TS. Phạm Ngọc Hồ, Giám đốc Viện Môi trường và Tự động hóa (IEA)

GS. TS. Bernhard Mueller, Giám đốc Viện Phát triển không gian sinh thái Leibniz (IOER)

MAREX Alliance

The participants of the German-Vietnamese workshop "Management of mineral resource extraction in Hoa Binh Province - A contribution to sustainable development in Vietnam" held from 27 June to 1 July in Dresden come to the following conclusion:

As part of the MAREX project the **MAREX Alliance** is established. The consortium includes:

- the Government of Hoa Binh Province,
- companies of aggregates mining in Hoa Binh Province.

Other organisations can be integrated.

The MAREX Alliance is coordinated by the Department of Natural Resources and Environment (DoNRE) of Hoa Binh Province in close cooperation with the Institute of Environment and Automatior (IEA).

During the term of the project MAREX Alliance is supported by the German MAREX project consortium led by the Leibniz Institute of Ecological Urban and Regional Development (IOER).

The MAREX Alliance has a consultative character and serves to advise the provincial government and the aggregates producing enterprises of Hoa Binh. Decisions are taken unanimously.

The main objective of MAREX Alliance is to promote the sustainable management of the extraction of raw materials for construction purposes in Hoa Binh Province in consideration of all affected interests.

To accomplish its objectives, the MAREX Alliance performs the following activities in the province of Hoa Binh:

- annual conferences for the sustainable management of the extraction of raw materials for construction
- seminars on important fundamental issues, for example, about environmental monitoring (2016), planning and control of mining activities, cleaner production (2017), as well as regional planning, balancing of interests and post-mining development (2018)
- additional workshops and training measures by agreement
- preparation of information for the public, business, politics and administration

Further measures may be conducted by decision of the partners.

Dresden, July 1, 2016

For the participants of the workshop:

Bui Van Khanh, Deputy Chairman of the Government of the province of Hoa Binh
Duong Thanh Binh, Deputy Director, Trung Son Cement Factory, Hoa Binh
Prof. Dr. Pham Ngoc Ho, Director, Institute of Environment and Automation (IEA)
Prof. Dr. Bernhard Müller, Director, Leibniz Institute of Ecological Urban and Regional Development (IOER)

MAREX: Problem definition and structure of the project

The joint German-Vietnamese research project MAREX examines the environmental impacts of the construction boom in the capital Hanoi. In this way the project refers to the topic of Megacities in Asia, which has become a focus of international urban and regional research over the past two decades. MAREX's primary interest is the extraction of mineral raw materials for the construction industry (rock, sand, gravel), also known as aggregates. In the capital Hanoi and other Vietnamese cities, national urbanization policies and related land-use plans have triggered a strong growth in new neighborhoods with multi-storey residential and commercial buildings. Simultaneously, the government is investing in the modernisation and extension of overburdened infrastructure. This has fostered a strong demand for construction materials. As most of the requisite raw materials comes from the surrounding provinces, landscapes in these areas are undergoing dramatic change. Air, water and soil are being contaminated by emissions. The farming sector is losing more and more fertile land. The scientific investigations of MAREX are being carried out in the province of Hoa Binh, which borders Hanoi. The interdisciplinary approach aims to ensure sustainable development in Vietnam by improved management of the mining of mineral raw materials. The main goal is realised through four sub-objectives, which are associated with four project modules. These modules form the project structure. The first module is the development and implementation of software to facilitate the monitoring and evaluation of mining activities, including the environmental impact. The second goal is to promote the use of cleaner production principles and technologies in the mining industry and related capacity building for the planning of options to remediate polluted mining areas. Thirdly, the project focuses on the development of a tool for material flow analysis, which will support the quantitative estimation of the expected demand for bulk building materials. The fourth sub-objective is an integration of all tools developed in the other modules into a "business-policy interface" based on the concept of cooperative management, bringing together the private sector (producers, customers) with regional planning and environmental authorities.

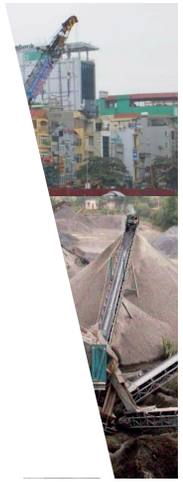
Dr. Peter Wirth | Vu anh Minh

Leibniz Institute of Ecological Urban and regional Development (IOER)

MAREX

Problem Definition and Structure of the Project

Dr. Peter Wirth / Anh Minh Vu
Dresden, June 28, 2016



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Background I

Urban growth

- Urbanization is a global trend
- UN in 2015: Up to 2030 more than 60 % of the worlds population is living in cities.
- Highest growth rate in newly industrializing nations (China, India)
- Vietnam: 2035: > 50% of the population will live in cities

  (Vn Government 2009; World Bank, MPI 2016)

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Background II

Political strategies and concepts

- Sustainable Development Goals (UN 2015)
  - No 11: Sustainable Cities and Communities
- Initiative "A resource-efficient Europe" (EU 2011)
- Germany:
  - National Resource Efficiency Strategy
  - FONA/Initiative Client: International Partnerships for Sustainable Technologies and Services for Climate Protection and the Environment
- Vietnam:
  - Decision of PM on National Green Growth Strategy (2012)
  - Law on Environmental Protection (2014)

Bildquelle: UN

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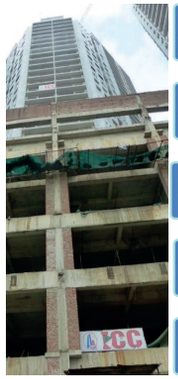
Challenges in research activities concerning MAREX



Driving Forces
- Economical growth in Vietnam
- Construction boom, Satellite cities (Ha Noi, HCM, …)

Pressure
- Increasing demand of construction materials

State
- Rise of mining operations in surrounding regions

Impact
- Devastation of landscapes, emissions, waste, land-use conflicts

Response
- Political concepts and strategies
- Implementation in practice

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Environmental challenges in mining and quarrying

- Damage of scenic places & landscapes
- Habitat loss
- Biodiversity loss

→ Impacts on tourism and recreation
→ Impacts on nature conservation

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Environmental challenges in mining and quarrying

- Contamination of surface and groundwater (turbidity)
- Changes in flow rates of surface and ground water

→ Impacts on landscape water regime
→ Impacts on water supply of communities
→ Impacts on agiculture

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Environmental challenges in mining and quarrying

- Land degradation
- Impacts of landfills to soil and water
- Wind and water erosion

→ Impacts on soil fertility
→ Impacts on agriculture
→ Impacts on biodiversity

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Environmental challenges in mining and quarrying

- Air pollution (dust)
- Noise emission
- Vibration

→ Impacts on local residents
→ Impacts on tourism and recreation
→ Impacts on nature conservation

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Project MAREX
- General Information -

MAREX (Deutschland)
- Permission: July 2015
- Period: 9/2015 to 8/2018
- Supported by BMBF (FONA)
- Lead: Leibniz Institute for Ecological Urban and Regional Development, Dresden (IOER)
- Prof. Dr. Bernhard Müller

MAREX (Vietnam)
- Permission: December 2015
- Period: 01/2016 to 12/2018
- Supported by MoST & Province of Hoa Binh
- Lead: Institute of Environment and Automation, Hanoi (IEA)
- Prof. Dr. Pham Ngoc Ho

Project MAREX
- Objectives -

- **Monitoring** of mining and its environmental impacts
- improve the capacities of mining companies with regard to the application of **Cleaner Production Technologies**
- Introduction of methods of **material flow analysis**
- Establishment of a communication platform **(Business-Policy Interface)** for sustainable management of mineral resource extraction

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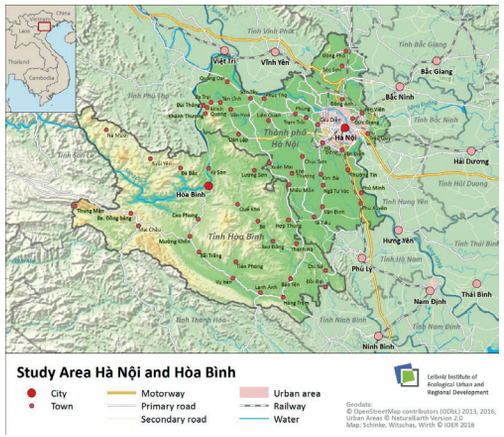
Research Area



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Project MAREX
– Cooperating Partners in Germany–

- Leibniz Institute of Ecological Urban and Regional Development (IOER), Dresden
- Technical University Dresden (TUD), Chair of Spatial Development
- Technical University Dortmund, Department of Spatial Information Management and Modelling (RIM)
- C&E Consulting and Engineering GmbH, Chemnitz

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C&E Consulting und Engineering GmbH

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Project MAREX

– Cooperating Partners in Vietnam –

Project partners

- The Institute of Environment and Automation (IEA), Ha Noi
- VNU University of Science, Vietnam National University, Hanoi; Research Centre for Environmental Monitoring and Modelling (CEMM)
- Province government Hoa Binh, Department of Natural Resources and Environment (DoNRE)
- Quang Long Company of Construction and Trading
- Hop Tien Company of Trading and Construction & Transportation
- Binh Minh Joint Stock Company of Trading and Construction

Further partners

- Institute of Geological Sciences, Vietnam Academy of Science and Technology
- Institute of Geological Technology and Minerals, Vietnam Union of Geological Sciences
- Department for Control of Mineral Activities-Northern Region Branch
- Viet Nam Institute of Urban and Rural Planning, Ministry of Constr.

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Project MAREX

– Modules and planned outcomes–

	Module 1	Module 2	Module 3	Module 4
Modules	Monitoring of mining and its environmental impacts	Technological questions of mining and environmental protection	Material flows in construction industry	Management of mining and raw materials
Outcomes	Outcome 1	Outcome 2	Outcome 3	Outcome 4
	Software for mining industry, administration and NGO's	Guideline for enterprises in mining and construction industry	Forecast Tool for urban policy, administration and construction industry	Business-Policy Interface

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Module 1

	Module 1	Module 2	Module 3	Module 4
Modules	Monitoring of mining and its environmental impacts	Technological questions of mining and environmental protection	Material flows in construction industry	Management of mining and raw materials
Outcomes	Outcome 1	Outcome 2	Outcome 3	Outcome 4
	Software for mining industry, administration and NGO's	Guideline for enterprises in mining and construction industry	Forecast Tool for urban policy, administration and construction industry	Business-Policy Interface

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Module 2

	Module 1	Module 2	Module 3	Module 4
Modules	Monitoring of mining and its environmental impacts	Technological questions of mining and environmental protection	Material flows in construction industry	Management of mining and raw materials
Outcomes	Outcome 1	Outcome 2	Outcome 3	Outcome 4
	Software for mining industry, administration and NGO's	Guideline for enterprises in mining and construction industry	Forecast Tool for urban policy, administration and construction industry	Business-Policy Interface

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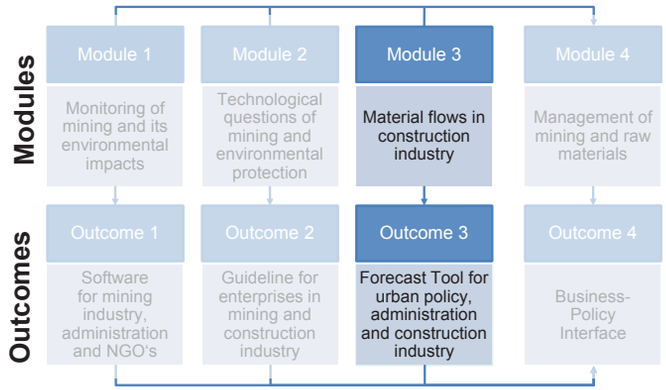
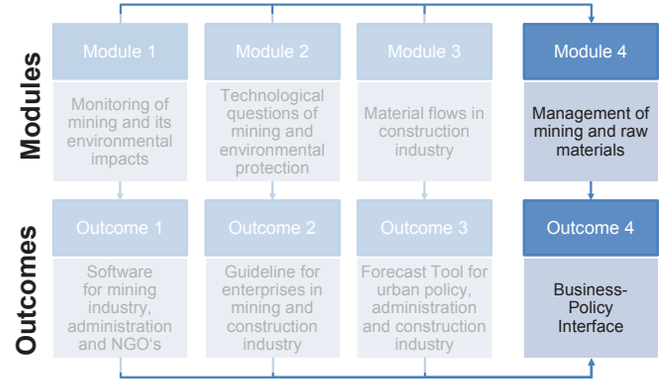
Module 3



Module 4



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Project MAREX
– Target groups –

- Political players in mining, land use planning and environmental planning (national level)
- Provincial administration
- Local policy makers and administrations
- Companies in construction and raw materials industry
- NGO's in environmental protection and nature conservation as well as civil society organisations
- Universities and research institutes

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Thank you for your attention!

Dr. Peter Wirth
Email: p.wirth@ioer.de

Vu Anh Minh
Email: m.vu@ioer.de

Leibniz-Institut für ökologische Raumentwicklung

Modelling of raw material extraction and its environmental impact

The project team of the TU Dortmund presents the status of information gathering and spatial data as well as the construction of a geo-database for monitoring mining activities in Hoa Binh province. Here the team focuses on (1) acquiring Landsat satellite images for the time points 1993, 2000, 2007, 2011, 2013 and 2015; (2) the detection and analysis of land use and the location of possible mining sites across Hoa Binh province at the time points listed above. Land use was classified on the basis of Landsat data into 7 categories (settlement, mining site, wet farmland, dry farmland, forest, bare soil, water) and the results validated using geological and other spatial data provided by the Department of Natural Resources and Environment (DoNRE) of Hoa Binh. Furthermore, the team shows the interim results of the conversion of measuring stations' coordinates and the processing of the measured data provided by DoNRE. The data was imported into the geographic information system ArcGIS (382 air monitoring stations, 13 soil monitoring stations, 41 surface and ground water monitoring stations, 150 waste water monitoring stations) and the results processed and visualized in the form of GIS maps. For the definition of further steps, the aforementioned geo-database is compared to a list of possible theoretical indicators to monitor the mining-environment-system and environmental impacts of mining operations. The theoretical indicators are classified according to the DPSIR principle (Driving forces, Pressures, States, Impacts, Response). The theoretical foundation and systematic structure of the indicators provide a basis for the modelling, simulation and evaluation of the mining-environment-system and for the development of a targeted decision support system (DSS) for the management of mining activities in Hoa Binh.

Prof. Dr. Nguyen Xuan Thinh | M.Sc. Haniyeh Ebrahimi Salari | Esther Bradel

Department of Spatial Information Management and Modelling

Faculty of Spatial Planning

TU Dortmund

technische universität dortmund

Federal Ministry of Education and Research

MINISTRY OF SCIENCE AND TECHNOLOGY

Monitoring and modelling of the extraction of mineral resources including its impacts on the environment

Prof. Dr. Nguyen Xuan Thinh, Haniyeh Ebrahimi Salari & Esther Bradel

PROF. DR. Nguyen Xuan Thinh, Haniyeh Ebrahimi Salari & Esther Bradel

FG Raumbezogene Informationsverarbeitung und Modellbildung
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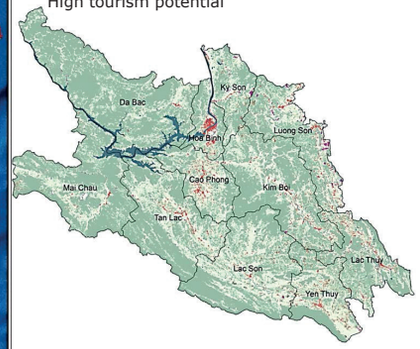
Hoa Binh
Mountainous province
The gateway to the North-West Region
A rich cultural history
High tourism potential



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Environmental effects of mining

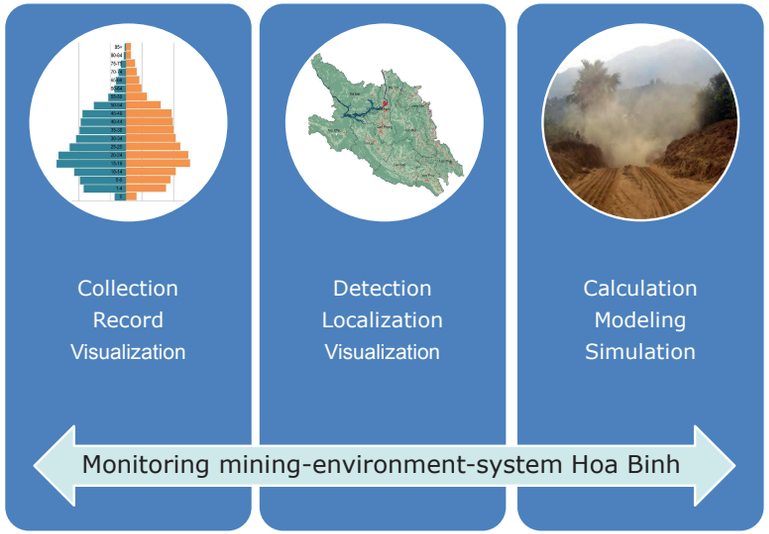
Devastation of landscape
Degradation of soils
Loss of biodiversity
pollution of
➔ Air, Water and Soil

Tác động môi trường của khai thác mỏ

Tàn phá cảnh quan
Suy thoái đất
Mất đa dạng sinh học
Ô nhiễm môi trường
➔ Không khí, nước và đất

3

Where, What, how much extraction + Which, how big are impacts, from where, whom?



4

Decision of the Prime Minister
Master plan of the monitoring system for resources and the environment by 2020

THỦ TƯỚNG CHÍNH PHỦ

Số: 16/2007/QĐ-TTg

CỘNG HOÀ XÃ HỘI CHỦ NGHĨA VIỆT NAM
Độc lập - Tự do - Hạnh phúc

Về việc phê duyệt "Q
tài nguyên và m

THỦ

Căn cứ Luật Tổ chức Ch

Căn cứ Luật Bảo vệ môi

Căn cứ Luật Tài nguyên

Căn cứ Pháp lệnh Khai
ngày 02 tháng 12 năm 1994;

Xét đề nghị của Bộ trư

3. Mạng lưới quan trắc tài nguyên và môi trường quốc gia là một hệ thống mở, liên tục được bổ sung, nâng cấp và hoàn thiện, kết nối và chia sẻ thông tin báo đảm thông suốt từ trung ương đến địa phương với sự quản lý thống nhất của Bộ Tài nguyên và Môi trường.

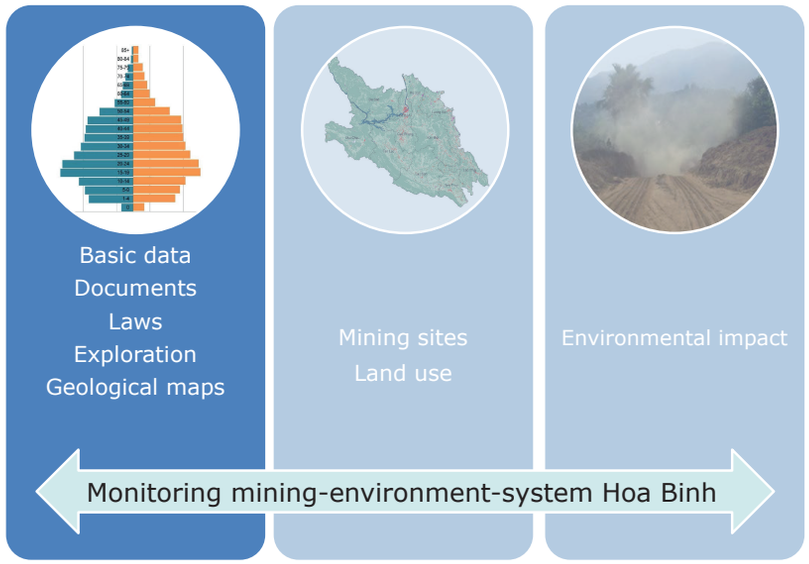
4. Từng bước hiện đại hóa công nghệ, máy
cơ sở áp dụng rộng rãi các công nghệ
thu, làm chủ được các công nghệ tiên

Integrating our work into the national system:

... an open system, which is continuously extended, updated,

completed, combines and gives information about resources and the environment

at all levels from local to the central ...

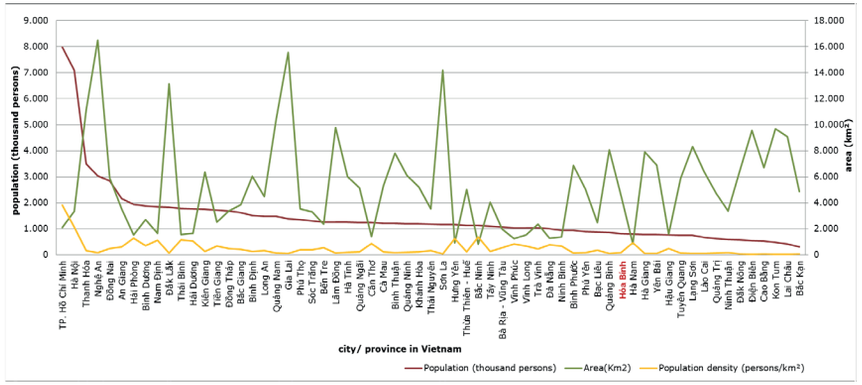


6

1	2
3	4

Population and area of cities and provinces in Vietnam, 2014

Hoa Binh	Population:	817.400 inhabitants	(rank: 48)
	Area:	4608,7 km²	(rank: 31)
	Population density:	177 persons/km²	(rank: 23)



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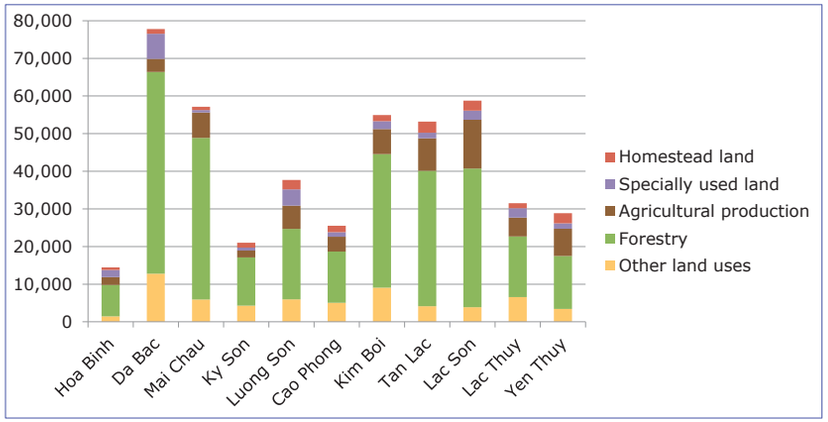
Land use in the province Hoa Binh by districts 2014 [ha]



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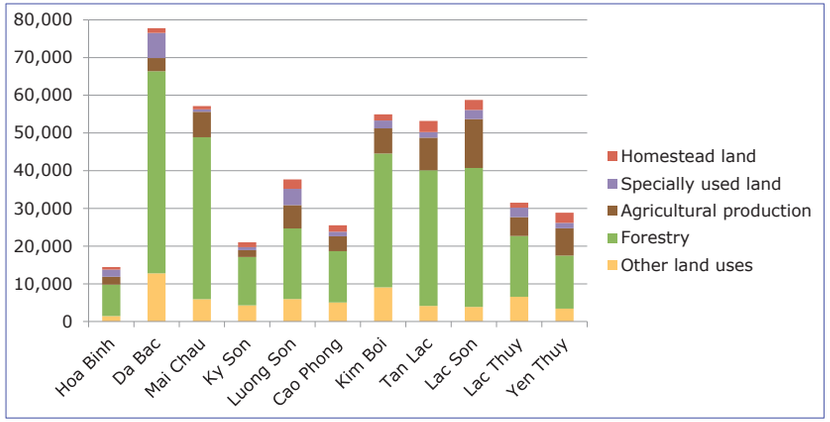
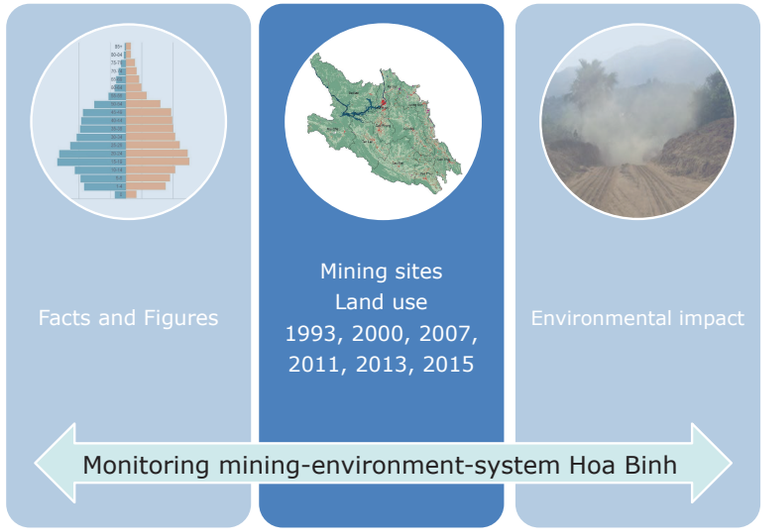
Land use in the province Hoa Binh by districts 2014 [ha]



9

Obtaining + Analysis of Landsat satellite images for Hoa Binh



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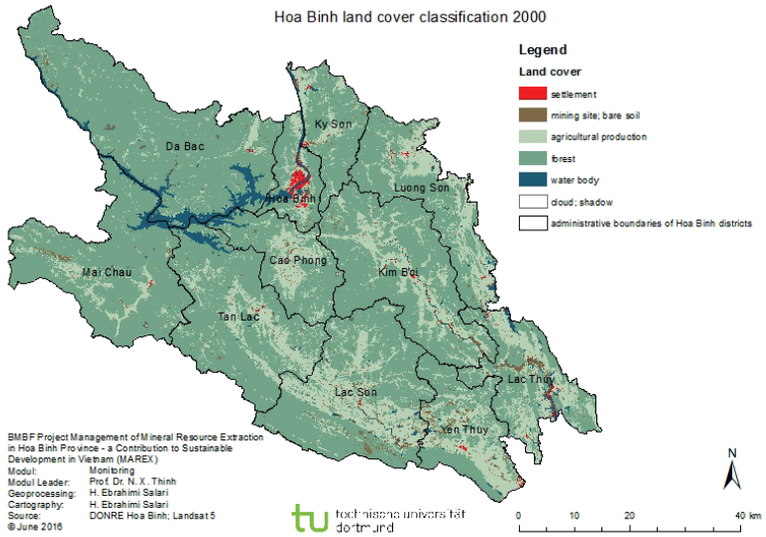

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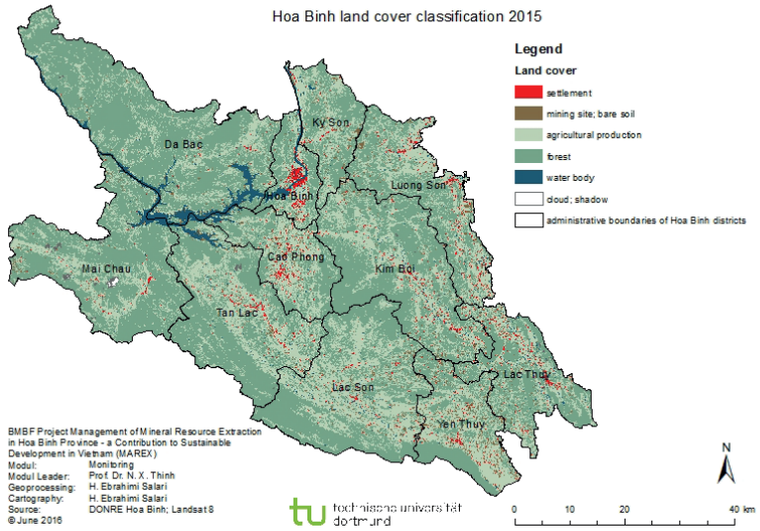
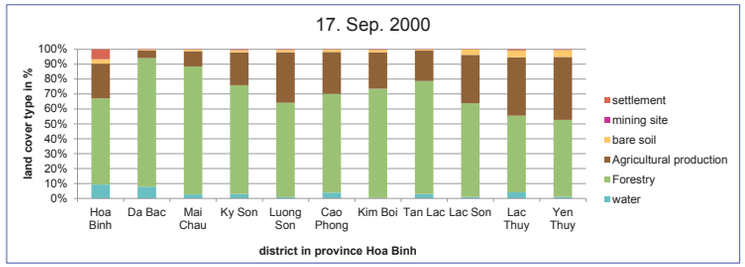
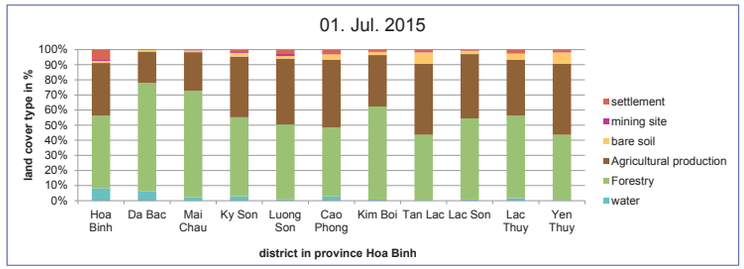


12

Forest cover of Hoa Binh decreased by 12%, 2000-2015





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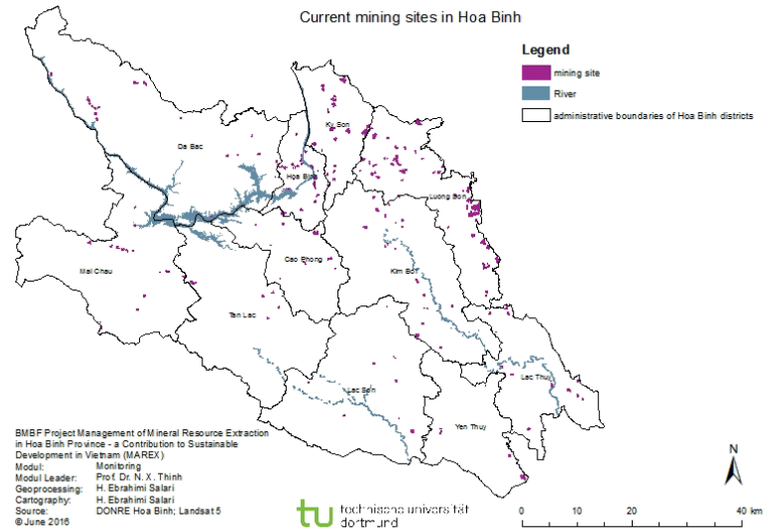

14

1	2
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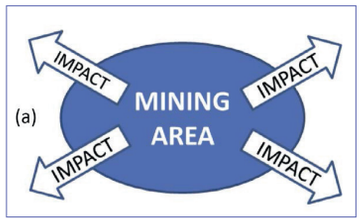
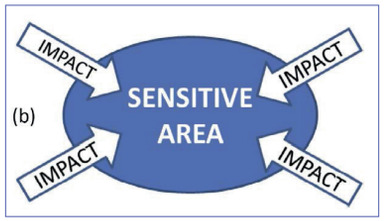
More than 10% of settlements areas within the 400m buffer zone of mining sites;

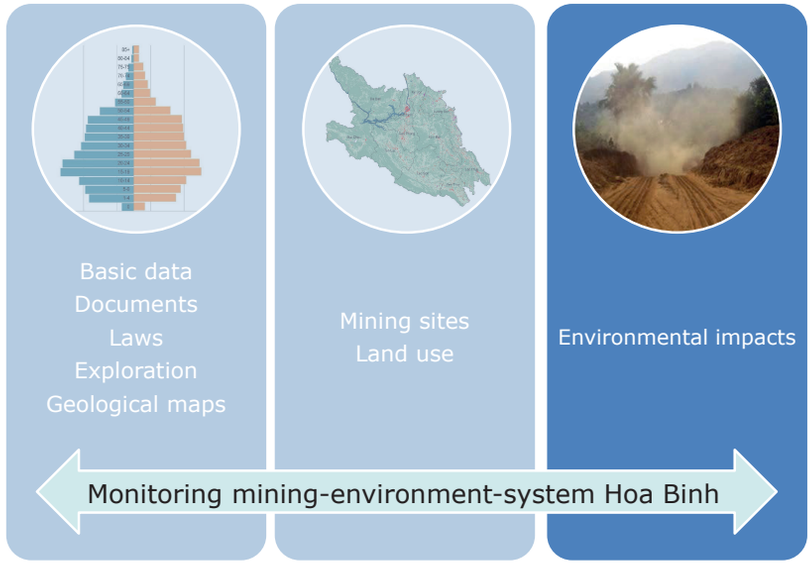
Buffer zone around mining sites (m)	Area of the settlements in buffer zone (ha)	Share of the settlements in buffer zone (%)
200 (Prohibited areas)	468,69	5,02
400 (High risk areas)	518,52	5,55
Total	987,21	10,57





Project-centred (a) and sensitive-area-centred (b) approach

15



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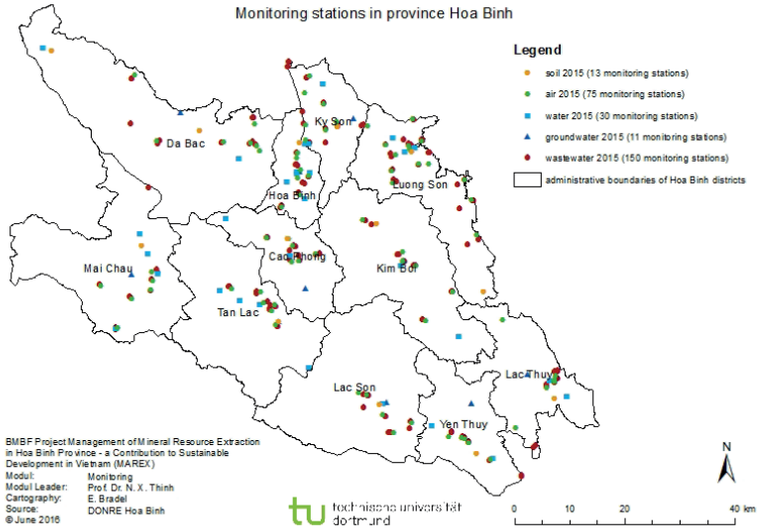
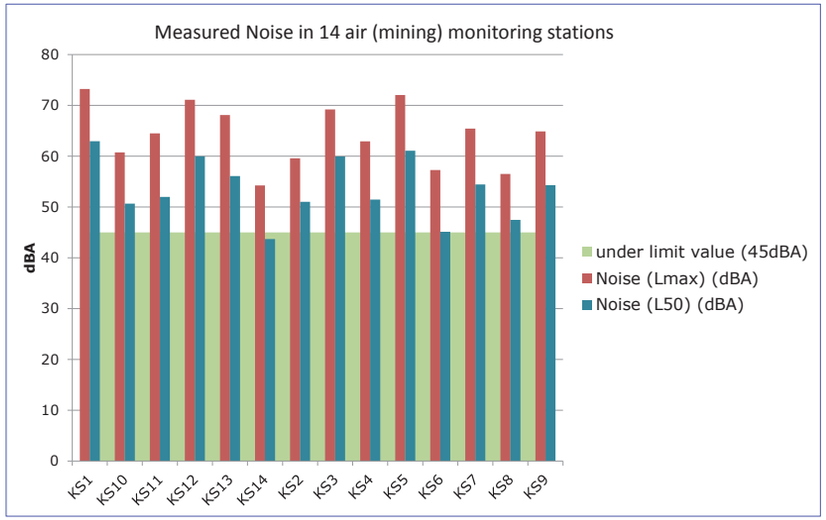


17

Exceeding of noise limits



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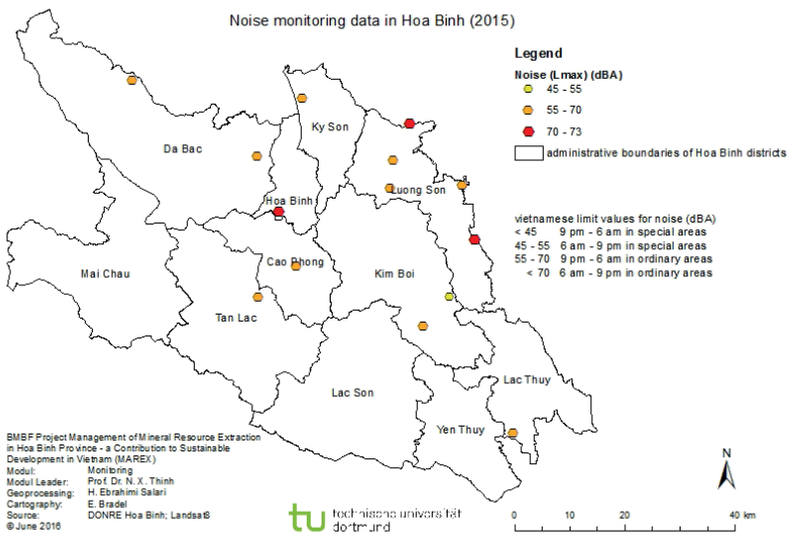
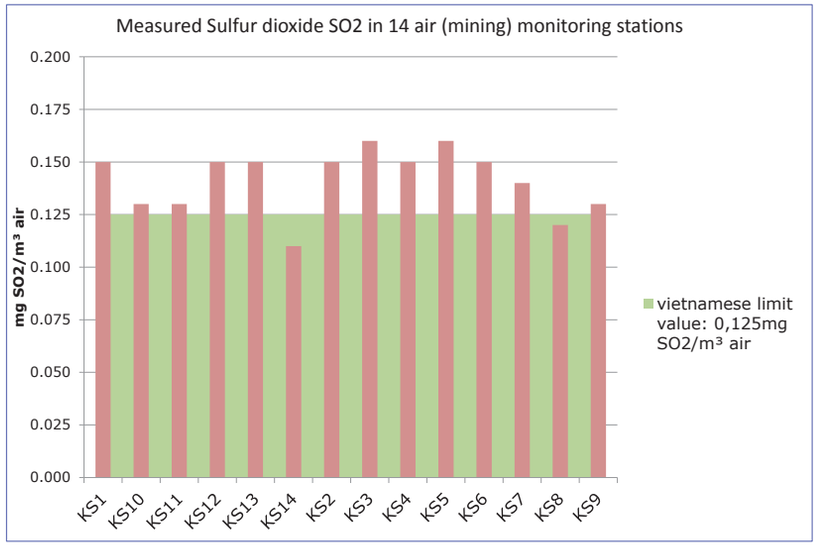


19

Exceeding of SO2 limits



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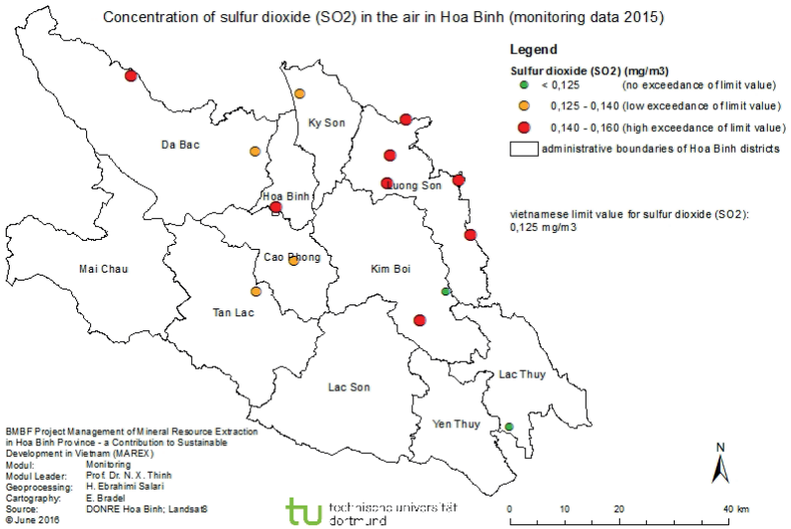
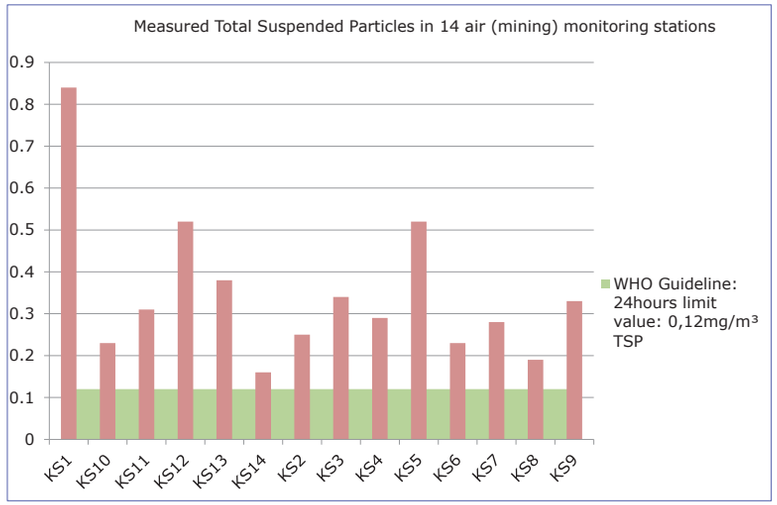


21

Massive exceeding of Total Suspended Particulates (TSP) limits



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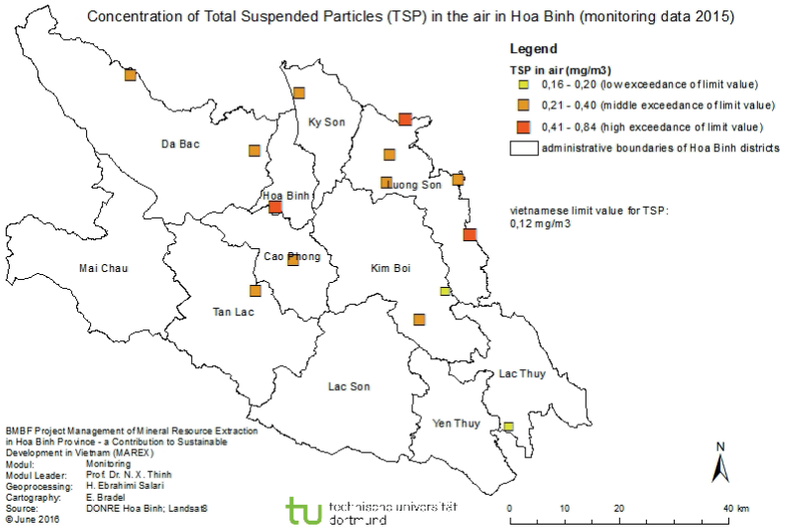
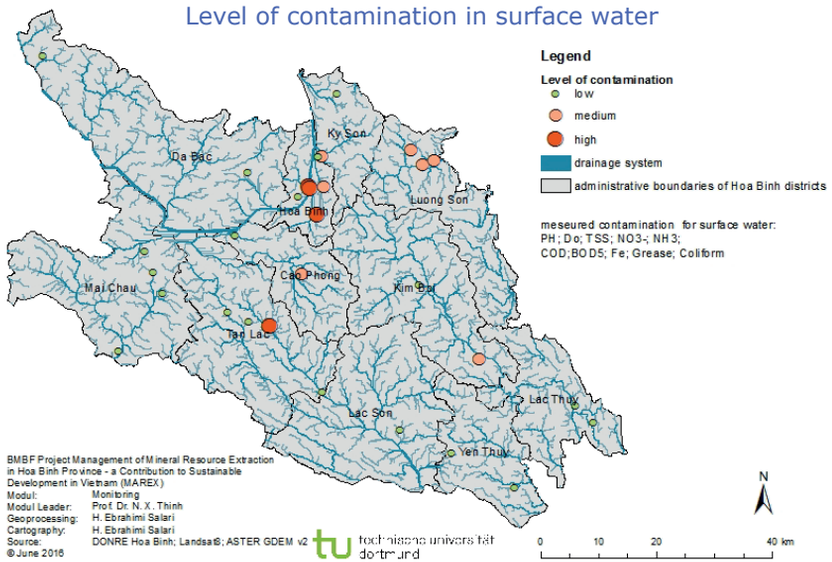


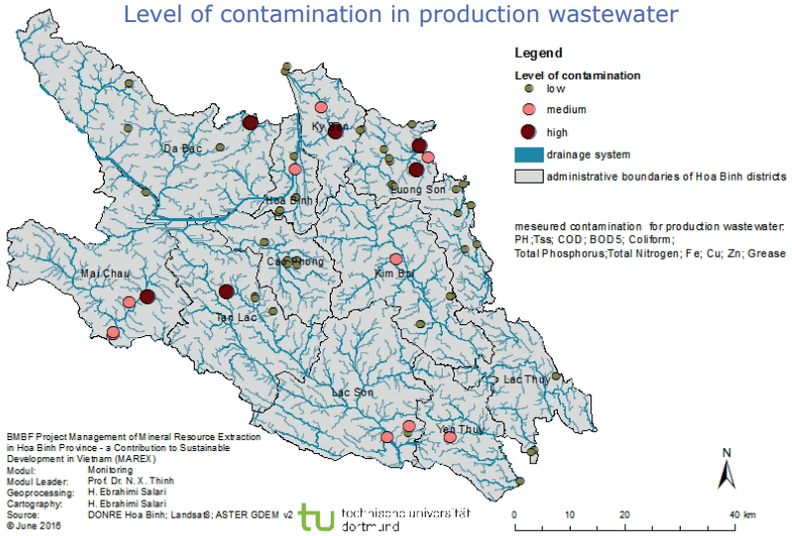
23

Level of contamination in surface water



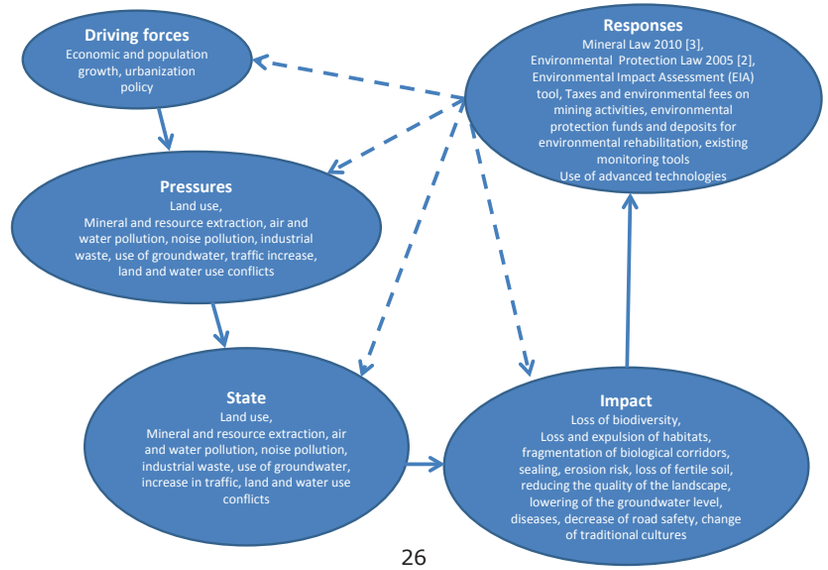
24

Level of contamination in production wastewater



25

Classification of indicators according to the DPSIR principle



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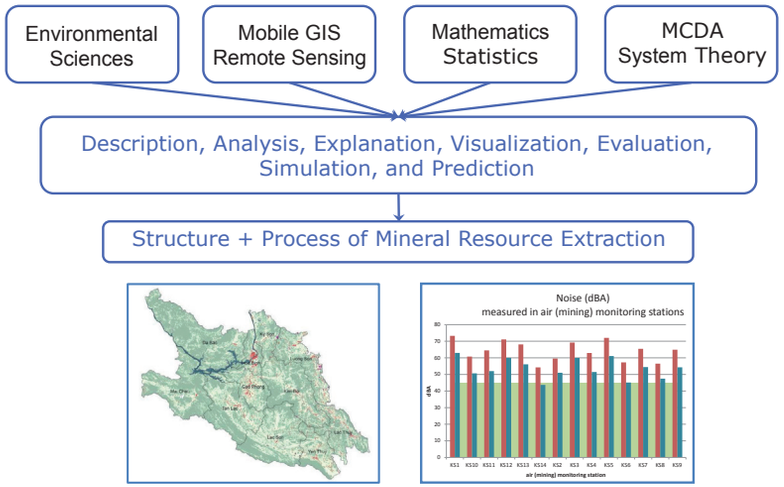
1	2
3	4

Overview – Methodology of Module 1



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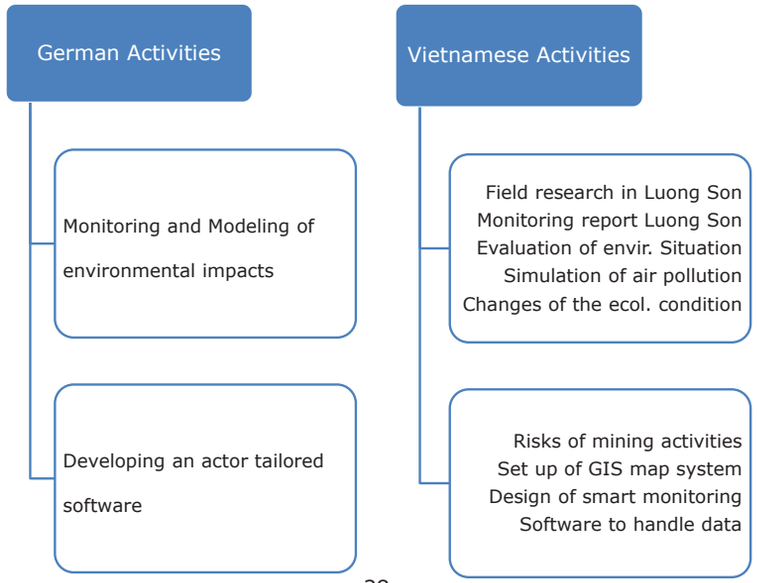


28

Assessment of the environmental quality of construction stone mining areas in Luong Son district (Hoa Binh province) using an aggregated index

Currently, many countries in the world – including Vietnam – apply methods of aggregate assessment of environmental quality using the environmental quality index (EQI). The aggregate index, which is integrated from individual indices to create a simple formula, can describe the general environmental quality at each survey site as well as compare the environmental quality at different points. However, there are some limitations to the EQI approach, e.g. the weight of a parameter is either ignored or subjectively defined by expert opinion and the hierarchical scale of the assessment is self-regulated, which can result in ambiguity and uncertainty (collectively called the "virtual effect"). In addition, almost all individual indices in EQI formulas are based on the segmented linear function according to the American method in order to devise lookup tables or diagrams. In this way they are not suitable for real-world application. To overcome these drawbacks, Pham Ngoc Ho has proposed an approach to develop a new index (Relative Environmental Quality Index-REQI) for the aggregate assessment of each environmental component, namely air, water and soil. In this paper, the authors apply the REQI to assess the quality of air, water and soil at three typical mining sites for construction materials (limestone, basalt and clay mine) in Luong Son district. Based on the REQI evaluation and the data gained from fieldwork, the authors propose recommendations to reduce environmental pollution in the mining areas in Luong Son district of Hoa Binh province.

Prof. Dr. Pham Ngoc Ho | BSc. Tran Ngoc Diep

Institute of Environment and Automation (IEA)

Vietnam Union of Science and Technology Associations (VUSTA)

Dr. Pham Thi Viet Anh

The Research Centre for Environmental Monitoring and Modeling (CEMM), Hanoi University of Science

1. AN OVERVIEW

❖ **Air quality:**

There are **four main methods** to assess the environmental quality:

- In some countries, including Vietnam, taking the highest value of the individual indices according to the approximation of curves by line segments method of US Environmental Protection Agency [1,2,3,6]:

$$EQI = \max\left(I_p\right) \quad (1)$$

$$I_p = \frac{I_{Hi} - I_{Lo}}{BP_{Hi} - BP_{Lo}}(C_p - BP_{Lo}) + I_{Lo} \quad (2)$$

- Taking the summation of the individual indices q_i (according to the approach of the former Soviet Union and some countries) [4]:

$$EQI = \sum_{i=1}^{n} W_i q_i \quad (3)$$

$$EQI = \sum_{1}^{n} W_i q_i \times 100 \quad (4)$$

1	2
3	4

1. AN OVERVIEW (continuing)

- Taking the arithmetic means or geometric means of the individual indices (Vietnam Department of pollution control and some countries) [5]:

$$\overline{EQI} = \frac{1}{n}\sum_{i=1}^{n} W_i q_i \quad (5)$$

$$\overline{EQI} = \frac{1}{n}\sum_{i=1}^{n} W_i \left[q_i \times 100\right] \quad (6)$$

$$EQI^* = \left[\prod_{1}^{n}\left(W_i q_i\right)\right]^{1/n} \quad (7)$$

- Combination of arithmetic means or geometric means [7].

❖ **Water quality:** [10-24]

❖ **Soil quality:** [25-28]

2. THE LIMITATIONS OF ABOVE MENTIONED METHOD

- The hierarchical scale of the environmental assessment is self-regulated (5-7 levels).
- The weighting factor of a parameter is subjectively defined by the criteria of experts.
- Some methods cause the ambiguity and eclipse (collectively called "Virtual effect").
- American method requires users to set up lookup tables or diagrams, so it is not convenient for application into reality.

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX BY PHAM NGOC HO

To overcome some of these limitations of EQI, Pham Ngoc Ho proposed a new approach to develop index for air, water and soil quality assessment, which is called the relative environmental quality index (REQI) [8-9; 22-26].

There are two approaches to build REQI:

- For air quality (set E=A; Q=P):

$$RAPI = 100 \times \left(1 - \frac{P_m}{P_n}\right) \quad (8)$$

- For water and soil:

Set E=W: $$RWQI = 100 \times \left(1 - \frac{P_k}{P_n}\right) \quad (9)$$

Set E=S: $$RSQI = 100 \times \left(1 - \frac{P_k}{P_n}\right) \quad (10)$$

1	2
3	4

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

Where:

$$P_m = \sum_{1}^{m_1} W_i q_i + \sum_{1}^{m_2} W_i (1 - q_i) \quad (11)$$

$$P_k = \sum_{1}^{k} W_i (q_i - 1) \quad (12)$$

$$P_n = P_m + P_k \quad (13)$$

m_1 is the number of parameters with q_i=1,

m_2 is the number of parameters with q_i<1,

k is the number of parameters with q_i>1,

n is the number of surveyed parameters.

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

- **Air:**

$$q_i = \frac{C_i}{C_i^*}$$

Ci - is the actual monitoring value of parameter i

C_i^* - is the permitted limit value of parameter i

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

- **Water: There are 3 cases:**

✓ **Group below in environmental regulation** (BOD_5, COD, Coliform, heavy metals as Hg, As...): $q_i = \frac{C_i}{C_i^*}$

✓ **Group above in environmental regulation** (DO): $q_{DO} = \frac{C_{DO}^*}{C_i}$

✓ **Group in the interval [a,b]** (pH):

- If $C_i \le a$ → $q_{pH} = \frac{a}{C_i} \ge 1$ (water with poor quality), when q =1 → water with moderate quality
- If $a < C_i < b$ → $q_i = \frac{b - C_i}{a - b} < 1$ (water with good quality)
- If $C_i \ge b$ → $q_i = \frac{C_i}{b} \ge 1$ (water with poor quality), when q =1 → water with moderate quality

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

- **Soil: There are 3 cases:**

✓ **Group below in environmental regulation** (the heavy metals group) => $q_i = \frac{C_i}{C_i^*}$

✓ **Group in the interval [a,b]** (the group of total content of bioelements and the group of content of available forms of bioelements)

- Nếu $C_i < a \rightarrow q_i = \frac{a}{C_i} > 1$ (Soil with poor quality)
- Nếu $a \le C_i \le b \rightarrow q_i = 1$ (Soil with moderate quality)
- Nếu $C_i > b \rightarrow q_i = \frac{b}{C_i} < 1$ (Soil with good quality)

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

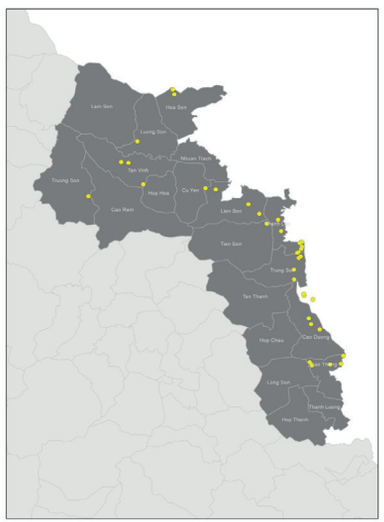
3.1.2. Hierarchical scale for air pollution assessment

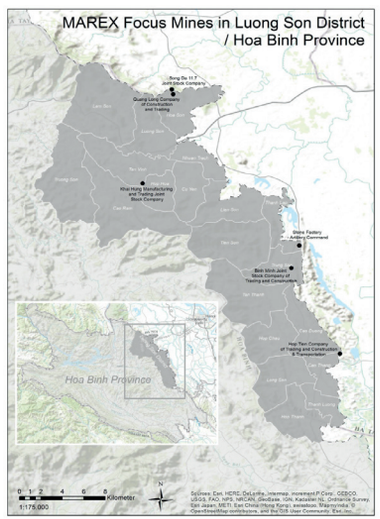
Table 2 - Hierarchical scale for air pollution assessment of RAPI/RAPI* (6 levels)

n even	n odd	Level of pollution	Color
$100\frac{n-1}{n} < RAPI_h \le 100$	$100\frac{n-1}{n} < RAPI_h \le 100$	Dangerous[6]	Brown
$50 < RAPI_h \le 100\frac{n-1}{n}$	$50\frac{n-1}{n} < RAPI_h \le 100\frac{n-1}{n}$	Very heavy pollution[5]	Purple
$\frac{100}{n} < RAPI_h \le 50$	$\frac{100}{n} < RAPI_h \le 50\frac{n-1}{n}$	Heavy pollution[4]	Red
$0 < RAPI_h \le \frac{100}{n}$	$0 < RAPI_h \le \frac{100}{n}$	Light pollution[3]	Orange
$0,5 < RAPI_h^* \le 1$	$0,5 < RAPI_h^* \le 1$	Borderline polution[2]	Yellow
$0 \le RAPI_h^* \le 0,5$	$0 \le RAPI_h^* \le 0,5$	Non-polluted[1]	Green

1 | 2
3 | 4

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)





3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

3.1. RAPI (air quality of 3 mines)

3.1.1. The final weighting factors Wi of parameters

Table 1 - The final weighting factors Wi of surveyed parameters

No.	Parameters	Unit	TCVN 3733/BYT			QCVN 05:2013/BTNMT		
			the permmited limit value	The temporary weighting factors W'	The final weighting factors W	the permmited limit value	The temporary weighting factors W'	The final weighting factors W
1	TSP	µg/m³	4000	3.210	0.046	300	20.700	0.206
2	SO2	µg/m³	10000	1.284	0.018	350	17.743	0.176
3	NO2	µg/m³	10000	1.284	0.018	200	31.050	0.308
4	O3	µg/m³	200	64.200	0.913	200	31.050	0.308
5	CO	µg/m³	40000	0.321	0.005	30000	0.207	0.002
	$\sum W_i$				1			1

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

Table 3 - Hierarchical scale for air pollution assessment of RAPI/RAPI* with n=5

n odd	Mức độ ô nhiễm	Màu sắc
$80 < RAPI_h \leq 100$	Dangerous	Brown
$40 < RAPI_h \leq 80$	Very heavy pollution	Purple
$20 < RAPI_h \leq 40$	Heavy pollution	Red
$0 < RAPI_h \leq 20$	Light pollution	Orange
$0,5 < RAPI_h^* \leq 1$	Borderline polution	Yellow
$0 \leq RAPI_h^* \leq 0,5$	Non-polluted	Green

1 | 2
3 | 4

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

The resulting bar chart of RAPI are shown in Figure 1 and figure 2.

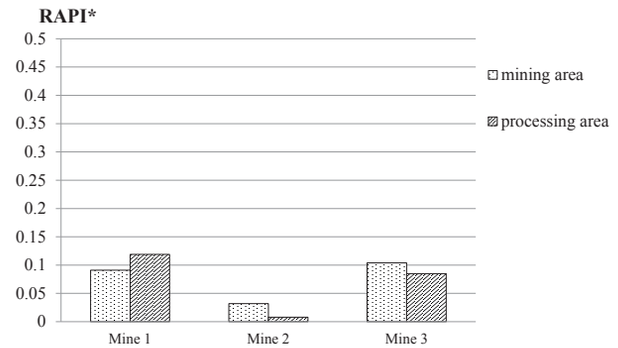


Figure 1 - Bar chart illustrates the relative air pollution index RAPI/RAPI* in mining areas and processing areas of 3 mines

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

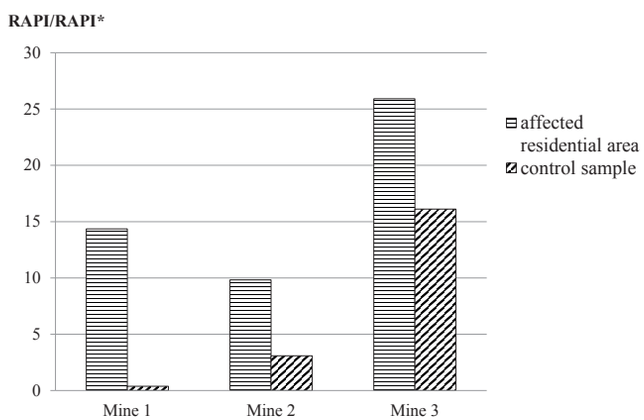


Figure 2 - Bar chart illustrates the relative air pollution index RAPI/RAPI* in the surrounding areas of 3 mines (residential areas)

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

3.2. ReWQI (surface water: lake, stream)

3.2.1. The final weighting factors Wi of surveyed parameters

Table 4 - The temporary weighting factors and the final weighting factors

TT	Parameters	Unit	the permmited limit value		The temporary weighting factors W'		The final weighting factors W	
			A		A		A	
			A1	A2	A1	A2	A1	A2
1	pH		6 - 8.5	6 - 8.5	1	1	0.063	0.088
2	Dissolved Oxygen (DO)	mg/l	≥ 6	≥ 5	1.1	0.9	0.069	0.080
3	TSS	mg/l	20	30	1.25	0.83	0.078	0.073
4	COD	mg/l	10	15	1.25	0.83	0.078	0.073
5	Ammonium (NH_4^+)	mg/l	0.3	0.3	1	1	0.063	0.088
6	Oils & grease	mg/l	0.3	0.5	1.33	0.8	0.084	0.070
7	Coliform	MPN or CFU/100ml	2500	5000	1.5	0.75	0.094	0.066
8	Fe	mg/l	0.5	1	1.5	0.75	0.094	0.066
9	As	mg/l	0.01	0.02	1.5	0.75	0.094	0.066
10	Pb	mg/l	0.02	0.02	1	1	0.063	0.088
11	Zn	mg/l	0.5	1	1.5	0.75	0.094	0.066
12	Cd	mg/l	0.005	0.005	1	1	0.063	0.088
13	Hg	mg/l	0.001	0.001	1	1	0.063	0.088
	$\sum W_i$						1	1

3.2. ReWQI (surface water: lake, stream)

3.2.1. The final weighting factors Wi of surveyed parameters

Table 4 - The temporary weighting factors and the final weighting factors

TT	Parameters	Unit	the permmited limit value		The temporary weighting factors W'		The final weighting factors W	
			A		A		A	
			A1	A2	A1	A2	A1	A2
1	pH		6 - 8.5	6 - 8.5	1	1	0.063	0.088
2	Dissolved Oxygen (DO)	mg/l	≥ 6	≥ 5	1.1	0.9	0.069	0.080
3	TSS	mg/l	20	30	1.25	0.83	0.078	0.073
4	COD	mg/l	10	15	1.25	0.83	0.078	0.073
5	Ammonium (NH_4^+)	mg/l	0.3	0.3	1	1	0.063	0.088
6	Oils & grease	mg/l	0.3	0.5	1.33	0.8	0.084	0.070
7	Coliform	MPN or CFU/100ml	2500	5000	1.5	0.75	0.094	0.066
8	Fe	mg/l	0.5	1	1.5	0.75	0.094	0.066
9	As	mg/l	0.01	0.02	1.5	0.75	0.094	0.066
10	Pb	mg/l	0.02	0.02	1	1	0.063	0.088
11	Zn	mg/l	0.5	1	1.5	0.75	0.094	0.066
12	Cd	mg/l	0.005	0.005	1	1	0.063	0.088
13	Hg	mg/l	0.001	0.001	1	1	0.063	0.088
	$\sum W_i$						1	1

3.2.2. Hierarchical scale for water quality assessment

Table 5 - Hierarchical scale for water quality assessment of ReWQI=I (5 levels)

n even	n odd	Water quality	Colour
$50\frac{2n-1}{n} < I \le 100$	$50\frac{2n-1}{n} < I \le 100$	Very good/Good (Very good when I = 100)	Green
$100\frac{n-1}{n} < I \le 50\frac{2n-1}{n}$	$100\frac{n-1}{n} < I \le 50\frac{2n-1}{n}$	Moderate	Yellow
$50 < I \le 100\frac{n-1}{n}$	$50\frac{n-1}{n} < I \le 100\frac{n-1}{n}$	Fair	Orange
$\frac{100}{n} < I \le 50$	$\frac{100}{n} < I \le 50\frac{n-1}{n}$	Poor	Red
$0 \le I \le \frac{100}{n}$	$0 \le I \le \frac{100}{n}$	Very Poor	Brown

1	2
3	4

Table 6 - Hierarchical scale for water quality assessment of ReWQI with n=13 parameters (set n=13 in Table 5)

n=13	Water quality	Colour
96.15 < RSQI ≤ 100	Good/Very good[1] (Very good when I = 100)	Green
92.31 < RSQI ≤ 96.15	Moderate[2]	Yellow
46.15 < RSQI ≤ 92.31	Fair[3]	Orange
7.69 < RSQI ≤ 46.15	Poor[4]	Red
0 < RSQI ≤ 7.69	Very Poor[5]	Brown

The resulting bar chart of ReWQI is shown in Figure 3.

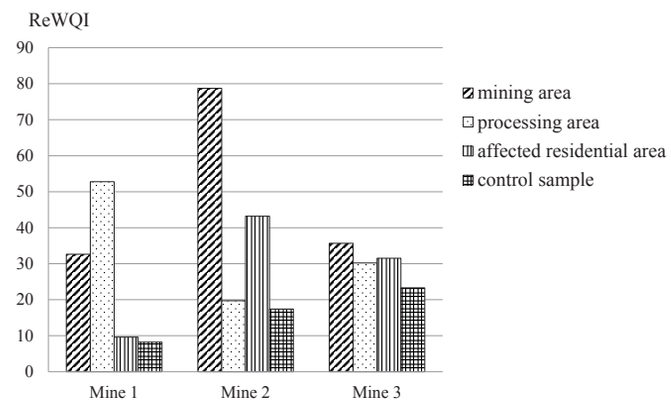


Figure 3 - Bar chart illustrates the surface water quality (lake, stream) of 3 mines by ReWQI

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

	Water monitoring Coordinates	
	Longitude	Latitude
Mine 1 - Hop Tien Company of Trading and Construction & Transportation		
Mining area	105°40'42.6"	20°41'44.0"
Processing area	105°40''37.2"	20°41'37.1"
Affected residential area	105°40'52.4"	20°41'14"
Control sample	105°41'22.4"	20°40'54.1"
Mine 2 - Quang Long Company of Construction and Trading		
Mining area	105°32'14.8"	20°55'28.3"
Processing area	105°32'12.2"	20°55'12.3"
Affected residential area	105°32'06.3"	20°55'19.8"
Control sample	105°32'31.0"	20°54'55.1"
Mine 3 - Khai Hung Manufacturing and Trading Joint Stock Company		
Mining area	105°30'51.7"	20°50'32"
Processing area	105°30'54.1"	20°50'25.8"
Affected residential area	105°30'54.4"	20°50'13.2"
Control sample	105°31'0.89"	20°50'16.6"

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

3.3. RSQI (soil quality)

3.3.1. The final weighting factors W_i of surveyed parameters

Table 7 - The final weighting factors W_i of surveyed parameters

No.	Parameters	Unit	The permmited limit value	The temporary weighting factors W'	The final weighting factors W
	The group of total content of bioelements				
1	OM	%	1.26 - 2.51	0.48	0.02
2	Total N	%	0.1 - 0.2	5.98	0.27
3	Total P_2O_5	%	0.06 - 0.1	14.94	0.68
4	Total K_2O	%	1 - 2	0.6	0.03
	$\sum W_i$				1
	The group of content of available forms of bioelements				
5	P_2O_5 bioavailable	mg/ kg soil	36 - 46	3	0.83
6	K_2O bioavailable	mg/ kg soil	100 - 150	0.6	0.17
	$\sum W_i$				1
	Heavy metals group				
7	Cd	mg/ kg soil	2	40.25	0.93
8	Cu	mg/ kg soil	50	1.61	0.04
9	Pb	mg/ kg soil	70	1.15	0.03
10	Zn	mg/ kg soil	200	0.4	0.01
	$\sum W_i$				1

1	2
3	4

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

3.3.2. Hierarchical scale for soil quality assessment

Table 8 - Hierarchical scale for soil quality assessment of RSQI=I

n even	n odd	Soil quality	Colour
$50\frac{2n-1}{n} < I \le 100$	$50\frac{2n-1}{n} < I \le 100$	Good/Excellent[1] Excellent when I =100 (no degration)	Xanh
$100\frac{n-1}{n} < I \le 50\frac{2n-1}{n}$	$100\frac{n-1}{n} < I \le 50\frac{2n-1}{n}$	Moderate[2] (Start degradation)	Vàng
$50 < I \le 100\frac{n-1}{n}$	$50\frac{n-1}{n} < I \le 100\frac{n-1}{n}$	Poor[3] (Degradation)	Da cam
$\frac{100}{n} < I \le 50$	$\frac{100}{n} < I \le 50\frac{n-1}{n}$	Very poor[4] (Strong degradation)	Đỏ
$0 \le I \le \frac{100}{n}$	$0 \le I \le \frac{100}{n}$	Hazardous[5] (Very strong degradation)	Nâu

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

The resulting bar chart of RSQI is shown in Figure 4.

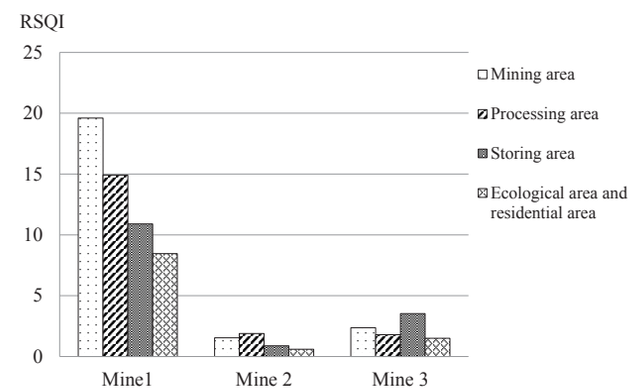


Figure 4 - Bar chart illustrates the soil quality of 3 mines by RSQI

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

The resulting bar chart of RSQI is shown in Figure 4.

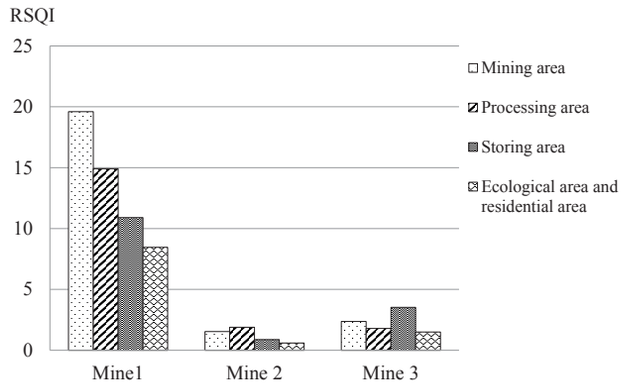


Figure 4 - Bar chart illustrates the soil quality of 3 mines by RSQI

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

	Soil mornitoring Coordinates	
	Longitude	Latitude
Mine 1 - Hop Tien Company of Trading and Construction & Transportation		
Mining area	105°40'48" E	20°41' 36,7" N
Processing area	105°40'38.8" E	20°41' 45.2" N
Storing area	105°40' 36.4" E	20°41' 45.8" N
Ecological and residential area	105°40' 57" E	20°41' 11.8" N
Mine 2 - Quang Long Company of Construction and Trading		
Mining area	105°32' 21.3" E	20°55' 31" N
Storing area	105°32' 9.8" E	20°55' 13.7" N
Ecological and residential area	105°32' 16.6" E	20°55' 12" N
Control sample	105°32' 30.5" E	20°54.5' 6.8" N
Mine 3 - Khai Hung Manufacturing and Trading Joint Stock Company		
Mining area	105°30'53.44" E	20°50'34.25" N
Processing area	105°30'50.04" E	20°50'31.71" N
Storing area	105°30'50.27" E	20°50'34.07" N
Ecological and residential area	105°30'55.49" E	20°50'18.78" N

1 | 2
3 | 4

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

Discussion: From these above bar charts:

- **Air:** The air quality in three surveyed mines is within the permitted limits of the regulation of Vietnam Ministry of Health for the working environment, but according to the technical regulation on ambient air quality (for surrounding areas where are affected), air quality is from light pollution to heavy pollution. According to individual indices, Total Suspended Particles (TSP) is main cause of air pollution.

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

- **Surface water:**

✓ The water quality in mining areas and processing areas (according to A1 and A2 standard of Vietnam technical regulation on surface water quality) is from poor to very poor, it can not be used for water supply purposes, just used for other purposes such as irrigating road and water traffic.

✓ For affected areas (residential areas), water is contaminated, water quality is from fair to poor. The result shows the signs of mercury (Hg) pollution (q_{Hg}=1,05-1,09).

3. METHOD FOR DEVELOPING THE AGGREGATE INDEX (CONTINUING)

- **Soil:**

✓ Mining area/ Processing area/ store area/ ecological and residential area is polluted, the soil quality is from poor to very poor (Strong degradation - very strong degradation respectively)

✓ These results are useful references for land reclamation in the process of environmental restoration after mine closure.

4. RECOMMENDATIONS TO REDUCE POLLUTION

- Spraying water after drilling and blasting in order to reduce environmental dust load.
- Setting up the suitable size of bulkheads in the raw materials processing area.
- Using cleaner production technology.
- Suppress dust by using water sprays on road transportation at least 3 times/day.
- The trucks going from the mine to the outside must be covered by canvas to avoid spillage and dust emissions.
- Covering product conveyors.

1	2
3	4

Reference

Air:

[1] Environmental Protection Agency, 2006/2012. Guideline for Reporting Daily Air Quality: Air Quality Index (AQI). United States Environmental Protection Agency. EPA – 454/B – 06- 001.

[2] Chỉ số ô nhiễm tổng hợp ngày của Hồng Kông (API_d) http://www.epd.gov.hk/epd/english/environmentinhk/air/air_quality/air_quality.html

[3] Cơ quan Bảo vệ Môi trường Nhà nước Trung Quốc (SEPA) – Chỉ số ô nhiễm ngày của Trung Quốc. http://www.semc.gov.cn/

[4] Berliand M.E, Forecast and Atmospheric Cotamination, Hydrometeorological Publishing House, Leningrad, 1985.

[5] Cục Kiểm soát Ô nhiễm Việt Nam (PCD), 12/2010. Thiết lập bộ chỉ số khoanh vùng khu vực ô nhiễm không khí.

[6] Tổng cục Môi trường Việt Nam, 2011. Hướng dẫn tính toán AQI (Chỉ số chất lượng môi trường không khí).

[7] Kurkilis G., Chaloulakou A., Kassomenos P.A., 2007 – Development of an aggregate AQI for an Urban Mediterranean agglomeration: Relation to potential health effects. Environment International, 33, 670-676.

[8] Ho Ngoc Pham, Loan Kim Dong, Anh Thi Viet Pham, Ha Thi Thu Pham, Bach Ngoc Duong, Applying Relative Air Pollution Index (RAPI) for aggregate evaluation of pollution level of ambient air environment at the automatic analysis monitoring station Nguyen Van Cu, Hanoi, Vietnam. 2015 International Conference on Information, Business and Management (IBM 2015), Paris, France.

[9] Phạm Ngọc Hồ, Đồng Kim Loan, Phạm Thị Việt Anh, Phạm Thị Thu Hà, Dương Ngọc Bách, Hướng dẫn đánh giá chất lượng môi trường không khí, nước và đất bằng chỉ số đơn lẻ và chỉ số tổng hợp, Nhà xuất bản Giáo dục Việt Nam, Hà Nội, 2015.

Reference

[18] V Wepen et al, "Development of a water quality index for estuary water quality management in South Africa", Water Research Commission, South Africa (2006).

[19] Liou, S., Lo, S., Wang S., "A generalized water quality index for Taiwan", Journal of Environmental Monitoring and Assessment, Vol.96, (2004), pages 35-52.

[20] Hulya Boyaciouglu, "Develop of a water quality index based on a European classification scheme", Water SA, Vol.4, (2007), pp 101-107.

[21] Prakirake Chaiwat, Pawinnee Chaiprasert and Sudarut Tripetchekul, "Development of Specific Water Quality Index for Water Supply in Thailand", Songklanakarin J. Sci. Technol., Vol. 3(1), (2009), pp. 91-104.

[22] Pham Ngoc Ho, "Total Water Quality Index Using Weighting Factors and Standardized into a Parameter", Journal of Environment Asia, Vol. 52(2), (2012), pp.63-69.

[23] Ho Pham Ngoc, Thi Ngoc Diep Phan (2014), Relative Water Quality Index – A New approach for aggregate water quality assessment, Proceeding of The 3rd International Symposium & Exhibition Innovative Monitoring & Forecasting Solutions, Vietnam Cooperation Initiative VACI 2014, Ministry of Natural Resources and Environment, Vietnam National University Press, Hanoi, p.51–62.

[24] Ho Pham Ngoc (2012) – Total Water Quality Index using weighting factors and standardized into a parameter. Environment Asia 5(2) (2012), p.63–69.

Reference

Soil:

[25] Phạm Ngọc Hồ , Một cách tiếp cận mới để đánh giá chất lượng đất thuộc đề tài ĐHQG Hà Nội: "Xây dựng bộ chỉ số chất lượng môi trường tổng hợp đối với từng thành phần: không khí, nước và đất, phục vụ công tác giám sát và quản lý môi trường", mã số: QMT.12.01, 2012–2014.

[26] Ho Ngoc Pham, Hai Xuan Nguyen, Anh Ngoc Nguyen, Diep Ngoc Tran (2015), Aggregate Indices Method in Soil Quality Evaluation Using the Ralative Soil Quality Index. Applied and Environmental Soil Science, vol. 2015, Article ID 253729, 8 pages. doi:10.1155/2015/253729.

[27] M. C. Amacher, K. P. O'Neil, C. H. Perry, Soil vital signs: A new Soil Quality Index (SQI) for assessing forest soil health, Res. Pap. RMRS-RP-65WWW, U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fort Collins, CO, USA, 12 p, 2007.

[28]. J. W. Doran, T. B. Parkin, Quantitative indicators of soil quality: A minimum data set in Methods for assessing soil quality, Soil Science Society of America Special Publication Number 49 (1996), pp. 25–37, Soil Science Society of America, Madison, WI, USA.

1	2
3	4

Implementation of "Cleaner Production" strategies in the aggregates industry. What is relevant for the mining companies in Vietnam?

Cleaner Production emphasizes precautionary, site-specific environmental measures to trace waste and wastewater emissions at their place of origin. Operational material and energy flow analysis are employed as a basis for internal improvements in industrial processes. The approach is generally rooted in quality, environment and occupational safety management rules as given in DIN ISO 9001, 14011 and 18001, and requires the integration of these rules. So far there has been no systematic application of cleaner production approaches to mining in Vietnam, although some data of the corresponding streams are collected in the context of operational management. Until now Cleaner Production strategies in mining lack a systematic approach and a roof under which the individual measures can be coordinated and integrated. Integrated management systems (IMS) are a potential solution to help fill this gap. IMS take a holistic, structured and step-wise approach by identifying key challenges, assessing the status quo, setting targets for policy, evaluating available policy options, engaging with stakeholders and helping to implement effective policies. The implementation of IMS is done through an iterative and cyclic approach.

This contribution describes the options of cleaner production approaches in mining while also taking into account tools of material flow and life cycle analysis. The differences to conventional environmental impact assessment are discussed. The potential key points for the implementation of Cleaner Production strategies in operational mining in Vietnam are:

- Measures for the technical optimization of mining operations in order to ensure resource efficiency (raw materials, energy) and reduction in hazardous substances,
- Technical safety measures for mining operations in order to improve occupational health and safety,
- Technical environmental protection measures in order to lower the environmental impact (waste water, waste products, noise, dust, vibration, exhaust gas …),
- Emergency preparedness,
- Mitigation of land consumption and rehabilitation of mining sites,
- Compensation of losses of natural habitats and ecosystem services,
- Implementation and enforcement routines in order to ensure regulatory compliance.

Scope for future work is the development of "Good Mining Practices" as a Code of Conduct for sustainable mining. Mining can become more environmentally sustainable by developing and integrating practices that reduce the environmental impact of mining operations. These practices include measures such as reducing water and energy consumption, minimizing land disturbance and waste production, preventing soil, water, and air pollution at mining sites, and conducting successful mine closure and reclamation activities.

Dipl-Ing. Klaus-Dieter Oswald | Dr. Wolfgang Riedel

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Prof. Dr. Petra Schneider

Magdeburg-Stendal University of Applied Sciences

Department of Water, Environment, Construction and Safety

Implementation of "Cleaner Production" Strategies in the Aggregates Industry. What is relevant for the mining companies in Vietnam?

Dipl.-Ing. Klaus-Dieter Oswald
Prof. Dr. Petra Schneider
Dr.-Ing. Wolfgang Riedel

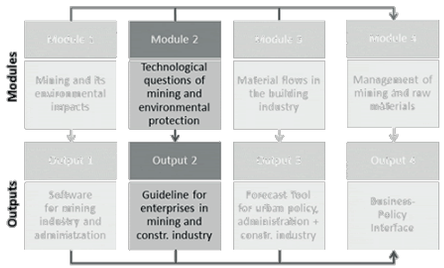
Content

- Cleaner Production (CP)
- Application of CP in Mining
- Integrated Management Systems
- „Good Mining Practice“

1 | 2
3 | 4

Module 2: Cleaner Production Technology

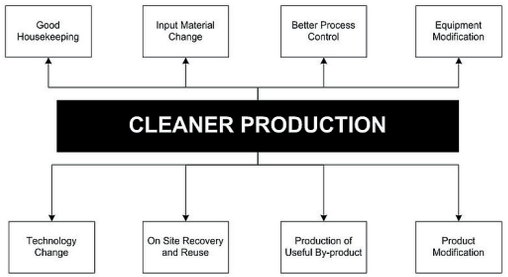
Module 2 is aiming at capacity building of mining companies with regard to planning of cleaner production technologies and environmental remediation in mining areas. The output is projected as a guideline to apply cleaner production techniques in the management of mineral resource extraction in Vietnam.



Cleaner Production

The United Nations Environment Program developed in 1991 the following CP definition that is still commonly used:

“CP is the continuous application of an integrated preventative environmental strategy to processes, products and services to increase efficiency and reduce risks to humans and the environment”.



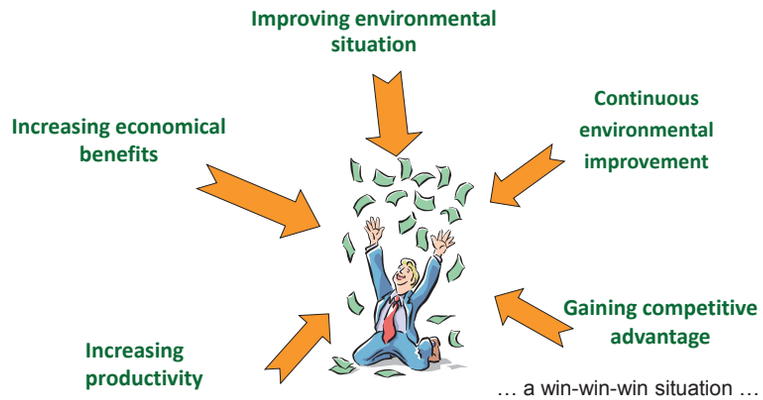
Source: United Nations Environment Program

Cleaner Production

- The goal is to improve the eco-efficiency in companies by implementation of technical or organisational actions
- By reducing the negative effects to the environment operating costs are reduced
- Cleaner Production works with process integrated – preventive - methods instead of End-of-Pipe solutions

5

What are the benefits of Cleaner Production?



… a win-win-win situation …

6

1	2
3	4

Cleaner Production

Cleaner Production emphasizes precautionary, site-specific environmental measures to trace waste and wastewater emissions at their place of origin by means of the operational material and energy flow analysis as starting points for internal improvements in industrial processes.

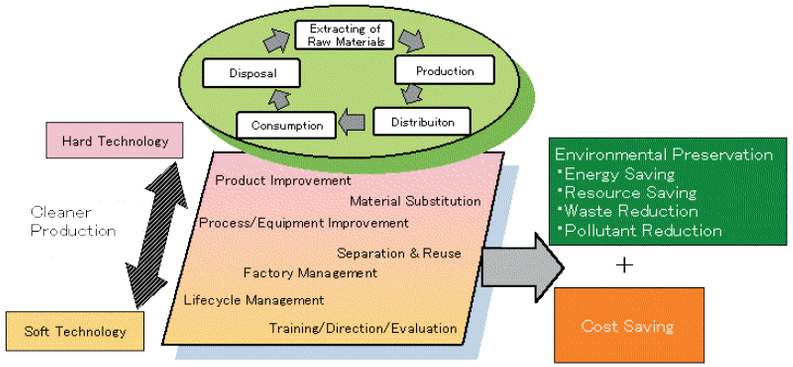
The approach is generally based on quality, environment and occupational safety management rules, as are given in DIN ISO 9001, 14011 and 18001, and forces the integration between them.

7

Management: PDCA Cycle

9

Cleaner Production and Application of the PDCA Cycle



Source: Global Environment Centre Foundation

Integrated Management Systems

Integration of several systems in one integrated system

- Quality Management
- Environmental Management
- Risk Management
- Occupational Health and Safety
- …
- Energy Management
- Information Management

1	2
3	4

Integrated Management Systems

Quality Management

Scope of the QMS

The quality management tasks are to make all management, planning and control activities in a way that the needs of the customer / market are satisfied. Basis: DIN EN ISO 9001

Principles of QMS
1. Customer-oriented organization
2. Leadership
3. Employee involvement
4. Process approach
5. System approach to management
6. Continuous improvement
7. Factual approach to decision making
8. Supplier relationships for mutual benefit.

Integrated Management Systems

Environmental Management

Scope of the EMS

Through preventive environmental hazard areas are identified, taken security measures, thus minimizing the risk of environmental damage and location-based contamination can be avoided. Basis: DIN EN ISO14001

Principles of EMS
1. Formulation of an appropriate corporate environmental policy with the company's commitment to meet these.
2. Establishment of a plan to meet the environmental corporate policy.
3. Implementation of environmental policy / environmental management system
4. Measurement, monitoring and evaluation of environmental performances.
5. System evaluation and continuous improvement.

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Integrated Management Systems

C&E

Risk Management

Scope of the RMS

Through a targeted analysis and consideration of the drivers affecting the company risks these are regularly assessed and measures to hedge against these risks are taken. Basis: ISO 31000

Principles of the RMS

based on the Deming Circle

Create a project plan (PLAN)
Reporting the actual condition (DO)
Definition of measures (check)
Evaluation of the Result (ACT)

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Integrated Management Systems

C&E

Occupational Health and Safety Management System

Scope of the OHS

A safety management system is intended primarily for employees and enterprises by accidental failures and faults as possible reduced to a minimum and the associated costs are kept low. Basis: OHSAS18001

As in any other management system are also in the Health and Safety Management System exist elements strategy, corporate policy, objectives, responsibilities, planning, documentation and continuous improvement of the system components.

However, the OHS must be supplemented in terms of company-specific requirements (eg. as safety sensitive areas).

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1	2
3	4

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Integrated Management Systems

C&E

Information Security Management System

Scope of the ISMS

An information security management system is a set of policies concerned with information security management or IT related risks..
Basis: BS 7799

Principles of ISM
1. Security company policy / security requirements
2. Organization of security
3. Classification and control of corporate assets
4. Personnel security
5. Physical and environmental security
6. Management of Communication
7. System development and maintenance
8. Information Security and Incident Management
9. Compliance with legal and organizational requirements

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Ressource Efficiency in Mining

C&E

- use resources more efficiently
- make not utilized to date local deposits available, under the provison, that they can be used more effectively by targeting the mineral potential
- Applicable in underground and surface mining, essential for aggregates industry

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Ressource Efficiency in Mining

additional use of ceiling strata as in environmental and civil engineering

Multicomponent extraction in a large quarry (Friedrichswalde-Ottendorf)

18

Impacts of Aggregates Mining on the Environment

- Contamination of surface water or ground water (turbidity)
- Changes to flow rate of surface or ground water
- Air pollution
- Damage to soils
- Wind and water erosion
- Noise or vibration
- Impacts of dumps on soil, water and air
- Loss of landscape
- Loss of flora and fauna, biodiversity
- Damage to heritage sites.

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1	2
3	4

Implementation of Cleaner Production strategies in Vietnam

- Technical optimisation measures of the mining operation in order to achieve resource efficiency (raw materials, energy, hazardous substances),
- Technical precaution measures of the mining operation in order to achieve improved occupational health and safety,
- Technical environmental protection measures in order to achieve a reduced environmental impact (waste water, waste, noise, dust, vibration, exhaust gas …),
- Emergency preparedness,
- Mitigation of the land consumption and mining site rehabilitation,
- Compensation of losses of natural habitats and ecosystem services,
- Implementation and enforcement routines in order to ensure the control.

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Precautionary Approach

In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.

Principle 15, Rio Declaration

21

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Precautionary Approach

C&E

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Principle 15, Rio Declaration

22

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Precautionary Approach in Mining

C&E

- Adopting environmental codes of practice
- Consulting with key stakeholders
- Comprehensive environmental impact andrisk assessment studies
- Environmental management systems
- Setting targets for environmental protection to the highest level technically achievable
- Constantly reviewing technical developments which could be applied to further reduce impacts or the risk of impacts

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„Best Mining Practice“

C&E

- “Best practice” is the best way of doing things.
- “Best practice” in mining protects the environment and reduces the impacts of mining, and adheres to the principles of sustainable development.
- “Best practice” is identified by bench-marking the performance of companies in an industry.
- Best practice is linked to continual improvement; Improvements in technology or in industry standards usually call for further improvement.

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Mining Management at Trung Son Cement Factory

NMTS is a cement manufacturing company with limestone as the primary raw material, making up at least 80% of the bulk required to produce one ton of clinker. The plant extracts limestone at the Loc Mon mine (Trung Son municipality), covering an area of 20 ha in the first stage, and about 100 ha in the second phase, with annual extraction capacity of 500,000 m^3. Production started in December 2014, and the ramp-up phase completed in March 2015. Currently the plant is running at 90% capacity. Clinker production is 2,250 tons/day or 67,500 tons/month, equivalent to 80,000 tons of cement/month. The plant supplies products to 10 customers, selling the cement products PCB30, PCB40, PBC30, PCB40 (detached) and clinker CPC50. The products are available in the provinces Phu Tho, Vinh Phuc, Hanoi, Thanh Hoa, Hoa Binh, Son La, etc. At present the plant has implemented measures of environmental protection management in the following fields:

- industrial waste water
- waste water from offices
- emissions, dust and noise
- management of mining waste materials

Regarding the utilisation of stone and earth admixtures unsuitable for cement production, the plant has recovered millions of cubic meters by crushing this raw material into “secpay” in order to produce unbaked bricks. The material meets national quality standards. The admixture is further supplied to the parent company for use in state road construction projects, while the remaining stone powder and stones ≤ 0.5 mm are processed into bricks to build the plant facility buildings. At present, the plant managers are drawing up a plan for the production of two billion unbaked bricks annually (to be developed in two phases). Physical waste from construction and demolition activities, from mining, from cement production and fly ash can be processed at the plant into useful materials that meet the demands of construction and social economic development while simultaneously reducing environmental pollution. By applying modern technology and automated processes, the plant will consume the entire physical waste flows from local industries. This technology will replace burnt bricks, which are recognised environmental polluters and whose production consumes land otherwise used for agriculture and forest development. Although the project is supported by state incentives, it still faces difficulties in regard to the large capital investment required, as well as an under-developed market due to consumers unfamiliarity with unbaked bricks.

Duong Thanh Binh

Vice-General manager of Trung Son Cement Plant, Hoa Binh Province

PRESENTATION
WORKSHOP IN GERMANY

MINING MANAGEMENT AT TRUNG SON CEMENT FACTORY

Author: Duong Thanh Binh
Address: Vice-General Manager, Trung Son Cement Factory, Luong Son district, Hoa Binh province

General information

- Name of company: Trung Son Cement Factory
- Address: Loc Mon village, Trung Son commune, Luong Son district, Hoa Binh province
- Company form: Subsidary – dependent accounting, investment license No. 0500442020-006, dated 16/12/2014, first approval by Hoa Binh Department of Planning and Investment
- Cement producer, mainly using limestone as raw material which represents >80% of used raw material per unit of clincker output

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I. Mineral extraction

- Situated at limestone mine "Loc Mon" Trung Son commune, with an area of 20ha (phase 1), and up to 100ha (phase 2), whereas maximal extraction of monolith limestone will reach 500.000m³ per annum.
- In order to achieve the necessary quantities, and uphold occupational safety and environmental protection exactly as planned, the plant management deploys the right technological processes and modern equipment, from extraction to drilling to transport

II. The Cement Plant

1. Current operation of the plant:

1.1. Scale, technology:

- The production line of the plant was chosen based on advanced equipment and modern production technology of rotary kiln using the dry technology with heat exchange towers and multiple decomposition.

- The production equipment is thoroughly aligned state of the art automatic systems of monitoring, measurement and automatic control which allows maximal use of resources, reducing energy consumption, leading to a product of high quality and stability, while ensuring the safety of the production process, industrial hygiene and environmental protection.

1.2. Product output and markets

- Plant operation started in December 2014, the testing phase has just finished (March 2015). Current production level is equal to 90% of planned capacity, with clinker output of 2,250 tons/day, 67,500 tons/month which is equivalent to 80,000 tons/month
- Signed sales contracts with 10 buying units, concerning the cement products PCB30, PCB40, PBC30, loose PCB40 and clinker Cpc50
- Our products are sold in several provinces, e.g. Phu Tho, Vinh Phuc, Hanoi, Thanh Hoa, Hoa Binh, Son La ...

2. Promote implementation of environmental protection, results of investment and operations of collection and waste treatment

2.1. Waste treatment:

- Waste water
  - Industrial wastewater: industrial waste water in cement (industrial hygiene) does not contain toxic substances, but high concentrations of solid substances the volume of industrial waste water is not exceeding 30 m³/day. Thus, the industrial wastewater is collected through closed ditches which are separated from rain water.

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2.1. Waste treatment:

- Waste water
  - Waste water treatment: average waste water volume at 35 m³/d arise from Office, the canteen will be separated and put in the waste water treatment station after ISO processing 6772-2000 will put in the drainage system of the plant.
  - The ditch containing industrial waste water channeled through the basin provided for removing oil and then to the central liquid waste treatment station (e.g. to remove heavy metal – if any and other polluters), with the process ending in the drainage system of the plant.

3. Applying new and clean technology

- With regard to quality of extracted materials, the plant has achieved standard as being required in cement production.
- The rate of equipment and the process of separation of stones and rocks is sufficient for cement production, normally the rate is at 30%
- In order to further use the resources and not having the need to invest in a dump site, to reduce pollution to ground water, the plant invested in 2 stone crushing lines as an intake of all useable material not of use for cement production

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3. Applying new and clean technology

- Achievements:
  - By crushing of tons of m³ of mixed rocks and earth the plant is producing "secpay", ensuring quality level according to national standards of Vietnam:
    - Secpy is is being used in State road construction
    - remaining material: stone flour and tiny stones sizing ≤ 0,5mm
  - The Cement plant has invested in a brick factory. The bricks were used to build the office buildings at production site.

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* Strategy on factory for unbaked bricks

- The plant is currently setting up a factory to produce unbaked bricks:
  - planned max. output of 2 billion bricks p.a.,
  - divided in 2 investment phases
  - generally targeting the further use or recycling of materials from
    - construction & demolition waste
    - mining activities
    - cement production
    - fly ash from combustion processes of coal-fired power plants etc.

... into useful materials that meet the demands of construction and social economic development , minimize the sources of environmental pollution.

* Strategy on factory for unbaked bricks

- The factory is applying modern technology of automation which could intake the solid waste output from the region, and from industrial zones.
- If developed, this technology will reduce brick-baking factory which are causing harmful impacts to the environment and consuming huge areas otherwise useful for agriculture and forestry.
- The introduction of cleaner production to the region, by producing unbaked bricks (from otherwise dumped stone-earth-materials) is a viable and promising approach.

5. Advantages and difficulties to implement the project on unbaked bricks

**** Advantages:***

- The (central) government is providing incentive schemes to the production of unbaked bricks.

**** Difficulties:***

- Big initial invesment
- Low market acceptance as the people are used to baked bricks

CONCLUSIONS

- To success in clean technology investment projects [of unbaked bricks], the State, the central administration, the People's Committee and its departments could
  - Utilize the resources from the Environmental Protection Fund of the province and
  - provide low interest loans to such projects
  - Provide other incentives according to law (for projects in cleaner technologies, environmental-friendly, saving energy…)
- Policies encouraging the use of the unbaked building construction projects in the province and in the country.

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Thank you for your attention!

Presenter: Duong Thanh Binh

Address: Vice-General Manager, Trung Son Cement Factory, Luong Son district, Hoa Binh province

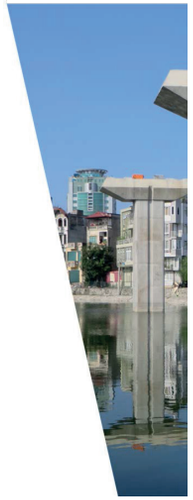
Dynamics of the built environment: An approach for modelling future material flows in the building industry

Some 90% of anthropogenic material flows are directed into the built environment in the form of buildings, roads and technical infrastructure. These flows are predominantly made up of mineral bulk materials with rather low specific added value. Hence, transport distances are limited to a maximum distance of approximately 25 to 50 km. As a result, we can conclude that building materials as well as construction and demolition waste are generally extracted, processed, used, disposed and recycled in one and the same region. Therefore, the dynamics of the built environment within a region largely determine demand for building material as well as the supply of secondary materials. Information on the dynamics of the built environment can thus provide valuable information, particularly to help estimate future material flows along the „value-chain“ of the construction industry. Here the “construction industry” is understood in a broad sense to encompass all steps and processes through which materials pass: from extraction in the mine through the manufacturing process, construction and demolition activities to the recycling or disposal of C&D waste. The adequate shaping of the framework for these processes involves various sectoral as well as cross-sectoral planning activities. This is the topic explored by the presentation, which considers how to calculate material flows induced by future dynamics of the built environment, the planning issues which must be addressed, and the requirements which should be taken into account regarding the MFA concept. Some examples from Germany are presented for the purpose of illustration as well as preliminary conceptual considerations regarding the material flow model for mineral bulk building materials in the metropolitan area of Hanoi.

Dr. Georg Schiller |
Jan Vogel

Leibniz Institute of Ecological Urban and Regional Development (IOER)

Dynamics of built environment - An approach for modelling future material flows in the building industry

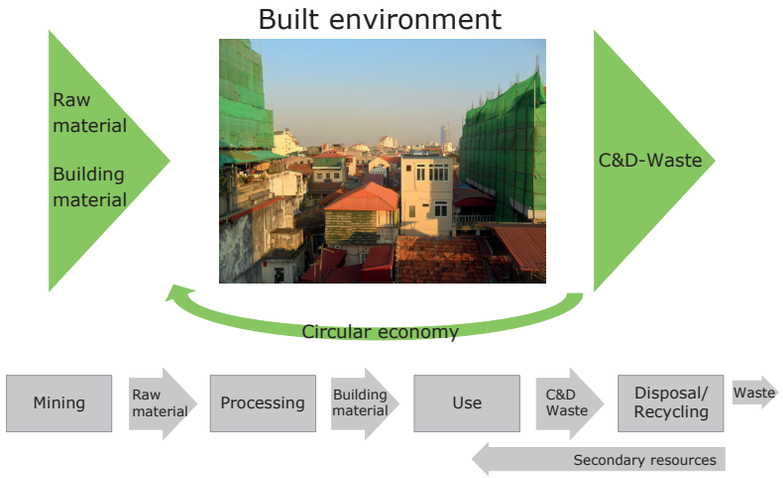


Georg Schiller, Jan Vogel

MAREX-Conference
28. Juni 2016

DRESDEN concept
Leibniz Institute of Ecological Urban and Regional Development

Material-Flow perspective



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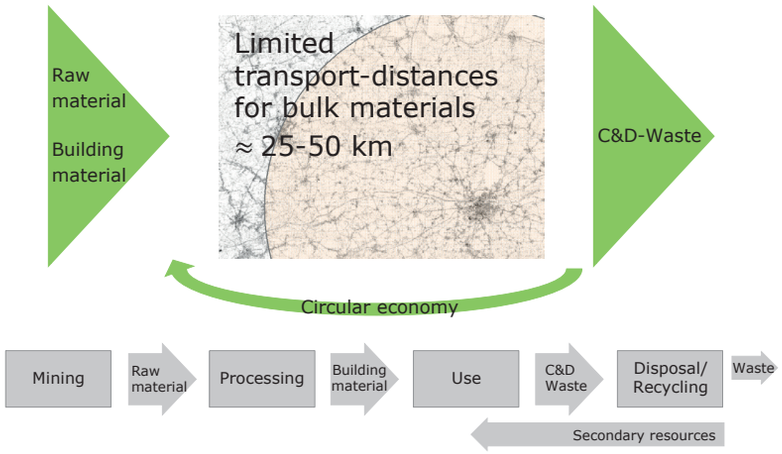
Regional perspective



Planning areas touched by MFA

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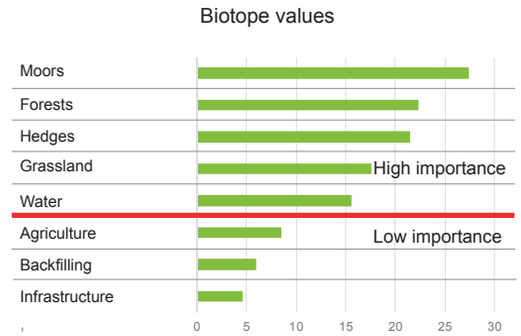
DRESDEN concept
Leibniz Institute of Ecological Urban and Regional Development

Planning areas touched by MFA

Assessment of land take due to material excavation

- e.g. considering nature conservation perspective



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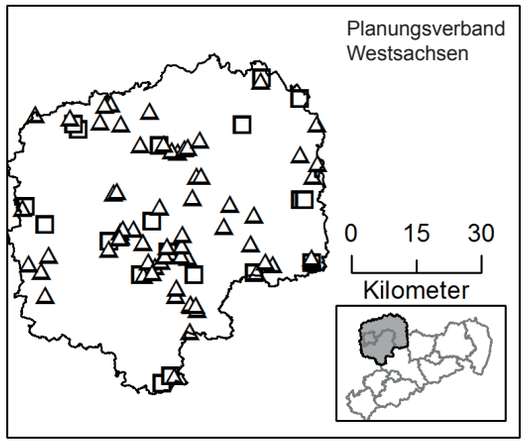
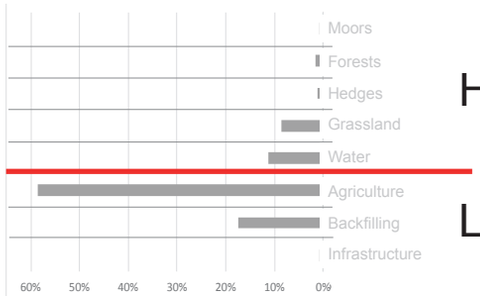
Land use planning for mining areas

- △ Priority area for mining
- □ Restricted areas for mining



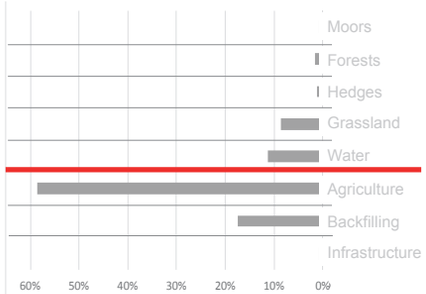
Distribution of potential excavation areas to areas with high and low „nature-conservation-importance" (%)



High importance

Low importance

Distribution of potential excavation areas to areas with high and low „nature-conservation-importance“ (%)



MFA:
Basis to estimate demand

Basis to identify potentials for reductions

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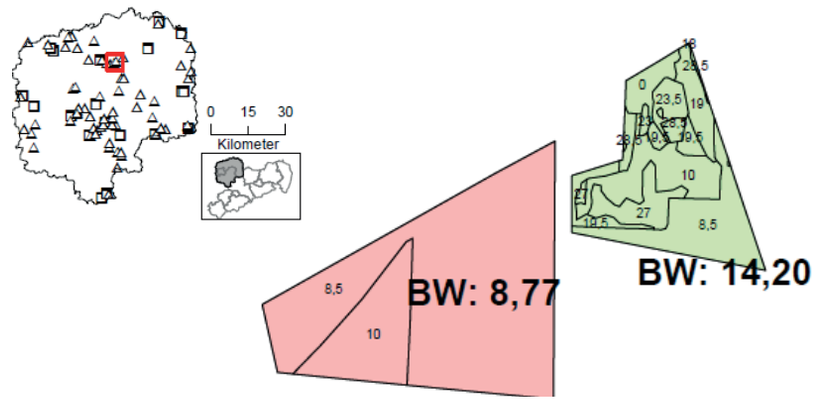
Link to land use planning



Priority mining
Priority nature conservation

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Planning areas touched by MFA

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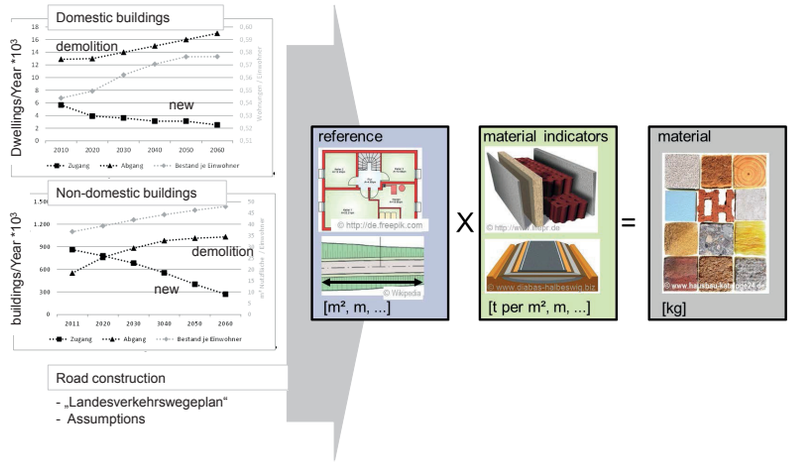
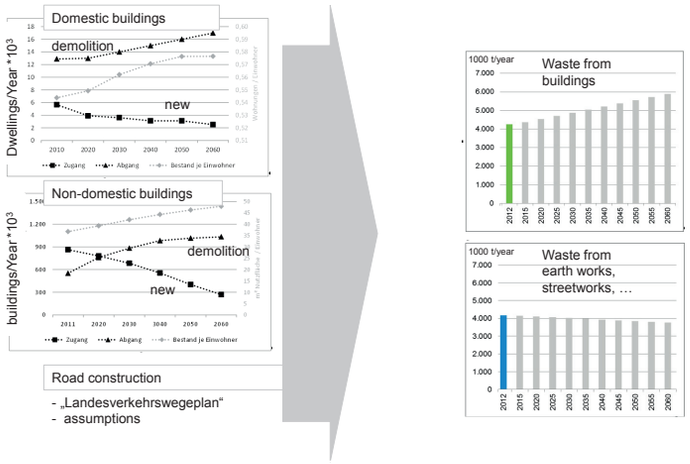
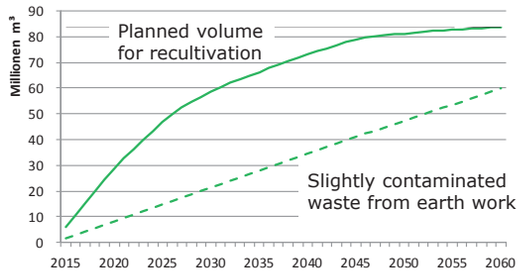
Translation of demolition activities e.g. to C&D-waste-flows



Translation of demolition activities e.g. to C&D-waste-flows



Potential for waste recovery



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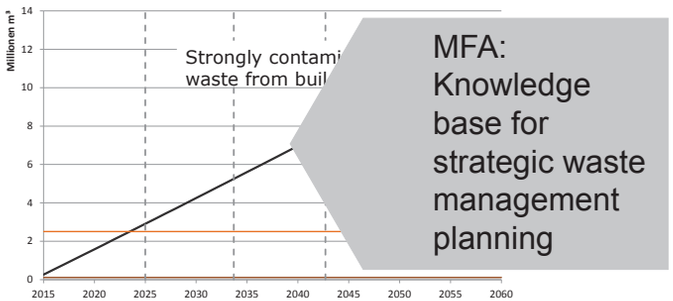
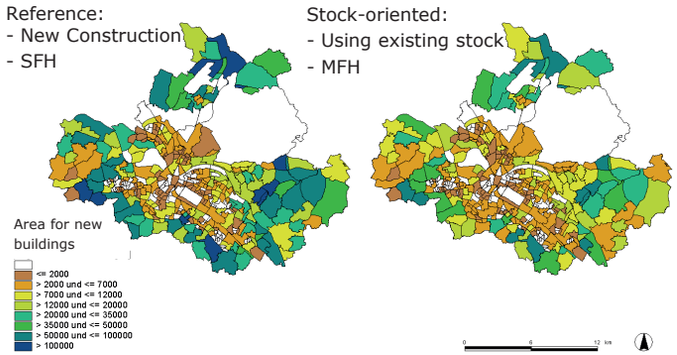
Landfill planning



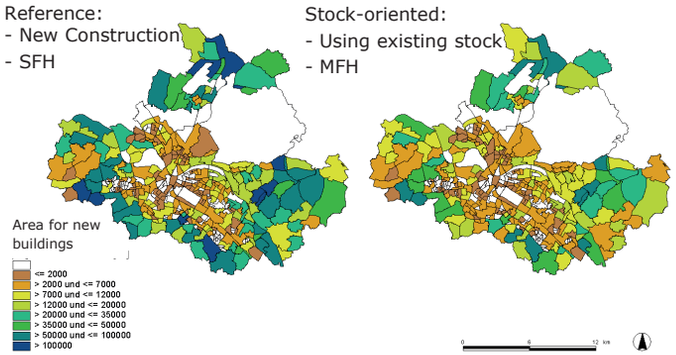
Alternative settlement development paths – Identical demand for dwellings



Alternative settlement development paths – Identical demand for dwellings

Reference:
- New Construction
- SFH

Stock-oriented:
- Using existing stock
- MFH



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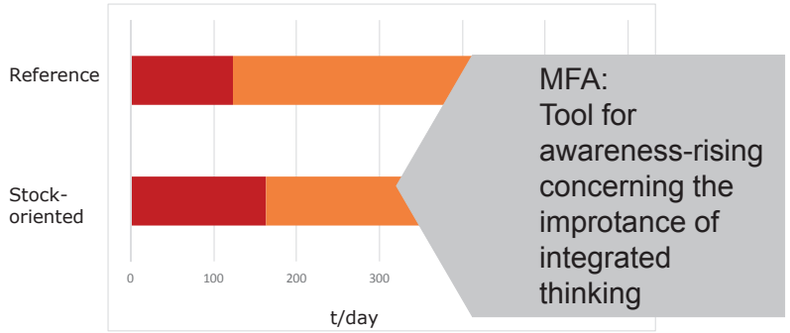
Demand for building material



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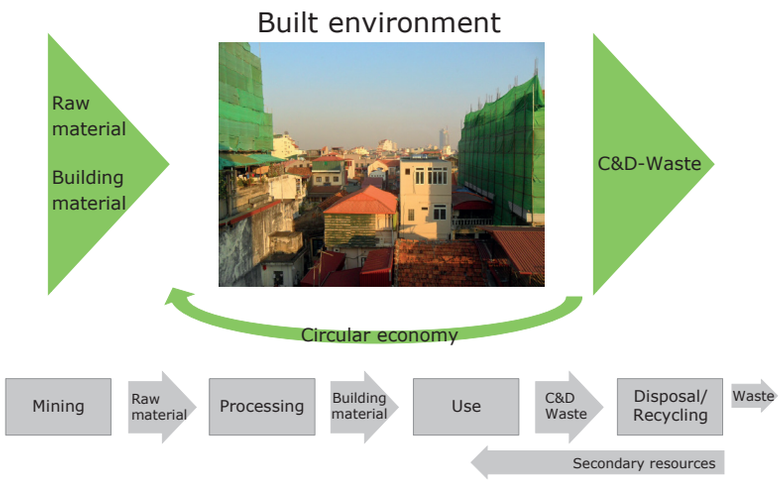
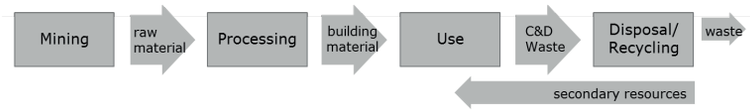
MAREX-MFA-Model APPROACH

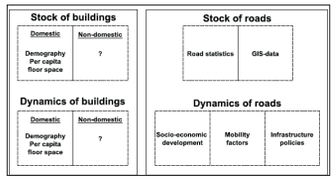


MAREX-MFA-Model APPROACH

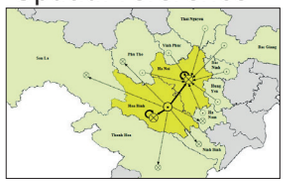
Process chain



Built environment



Spatial reference



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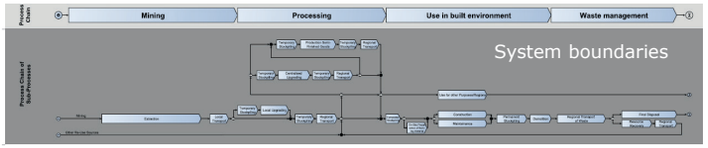
Process chain

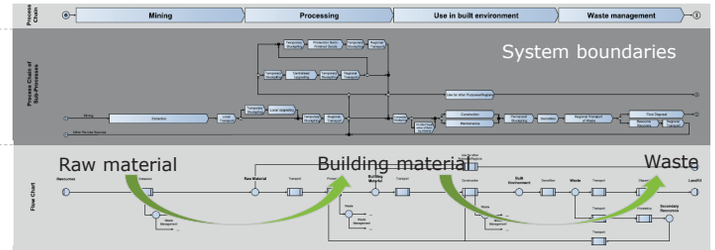
processes



Process chain

processes

stocks and flows



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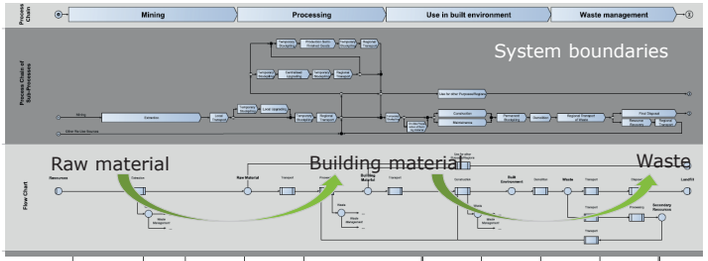
Process chain

Processes

Stocks and flows

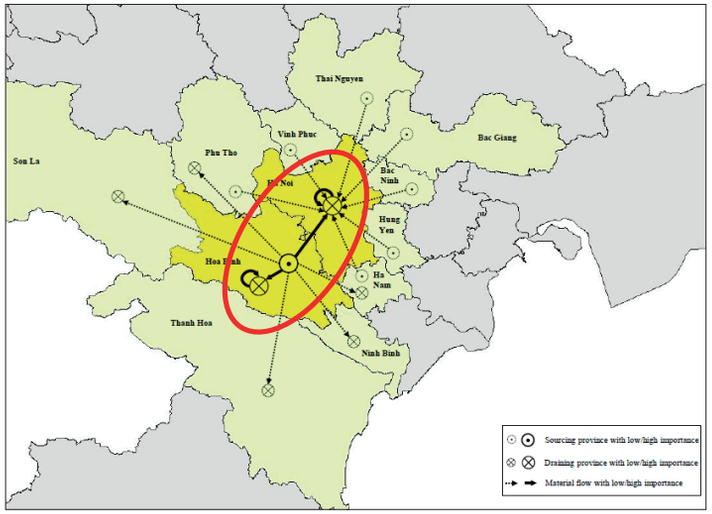


Case studies

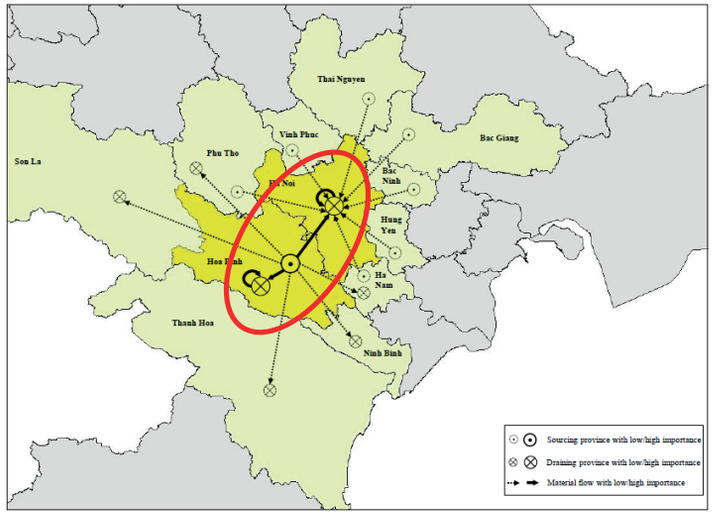
Company Công Ty	Number of Mining Sites Số mỏ đang khai thác	Type of Resources Loại tài nguyên	Mass of Reserves for each Resource Type (2015)	Mass of Reserves for each Resource Type (according to EIA report)	Type of Products Loại Sản Phẩm		Mined Mass per Year in m³ (2013) (Khối lượng khai thác trong năm 2013 (khối lượng đá thành phẩm)	Mined Mass per Year in m³ (2014) Khối lượng khai thác 2014 (khối lượng đá thành phẩm)	Mined Mass per Year in m³ (2015) Khối lượng khai thác 2015	Mined Mass per Year in m³ (Planned 2015) Khối lượng khai mỏ theo kế hoạch	Mass K	
					Resource Sản Phẩm	Size Kích Thước					Hoa Binh	Ha Noi
Mỏ đá Basalt Công ty CP Sông đà 11.7	1	Basalt	6.660.400	9.186.500	Basalt	0-5mm						
					Basalt	5-10mm						
					Basalt	10-19mm						
					Basalt	>20mm						
					Stone (đá sub base)							
Quang Long	1	Basalt	5.210.156	5.210.156	Basalt	10-50 cm						
					Basalt	4-6 cm						
					Basalt	2x4 cm						
					Basalt	1x2 cm						
					Basalt	0,75 cm						

- Understand processes
- Justify assumptptions
- Stakeholder involvement

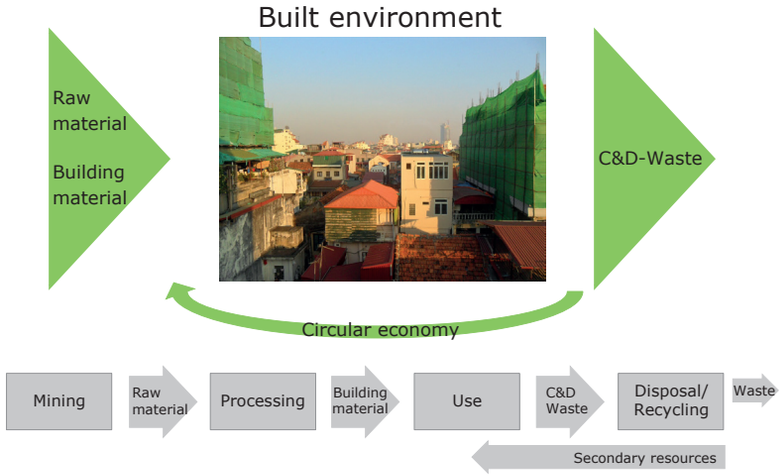
Spatial reference



Spatial reference



Rough estimations for material flows in Hanoi region



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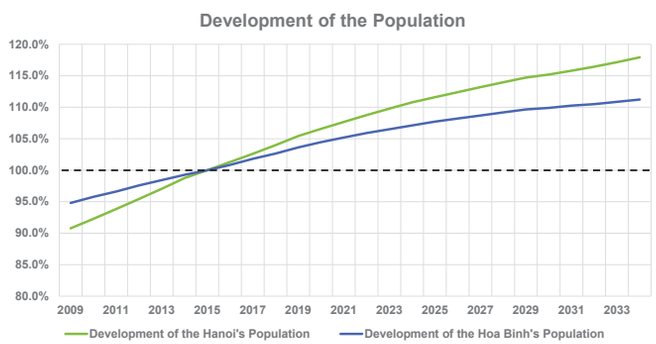
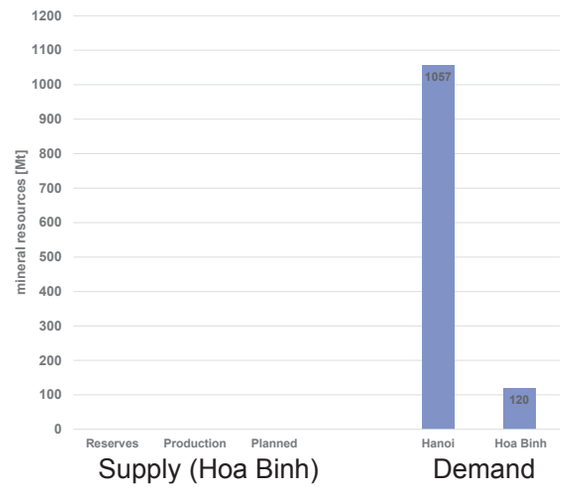
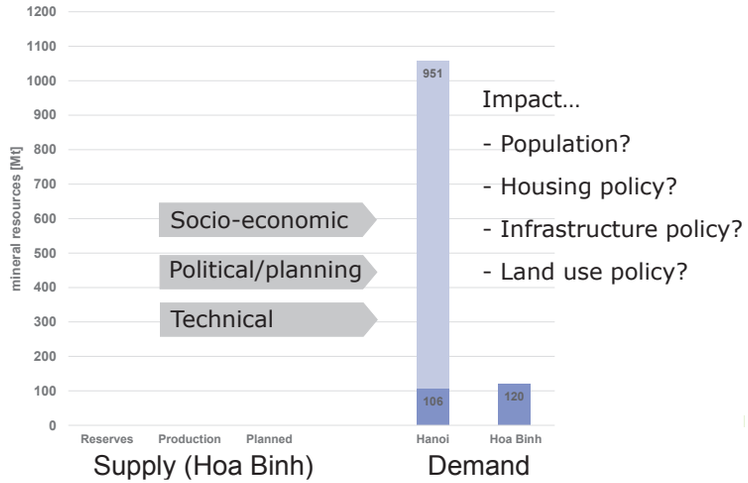
Hanoi / Hoa Binh – Population dynamic



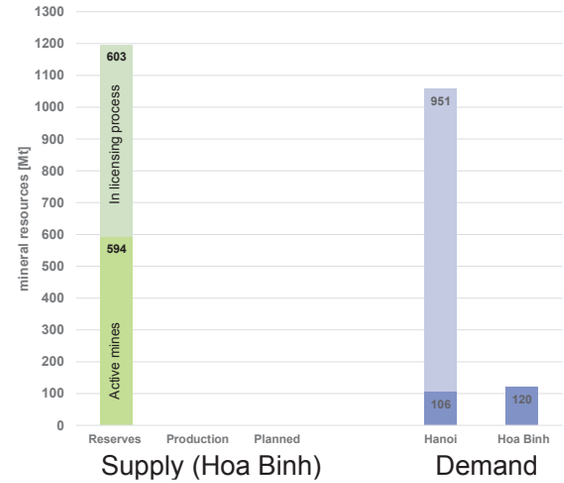
Demand and supply of mineral resources (2015-2030)



Demand and supply of mineral resources (2015-2030)



Demand and supply of mineral resources (2015-2030)



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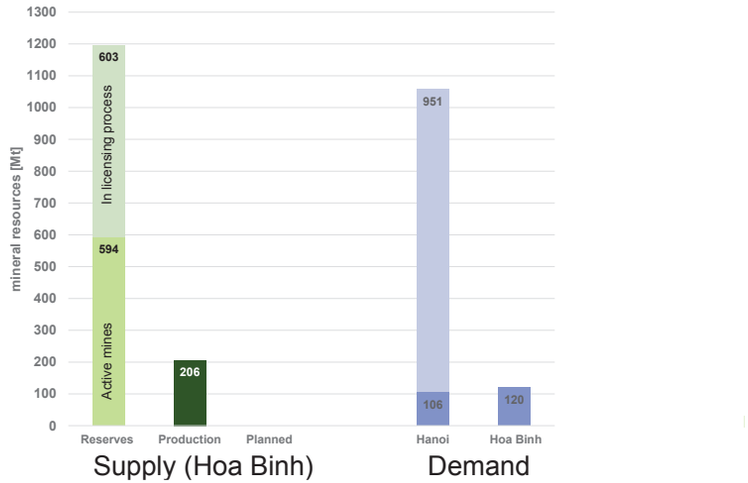
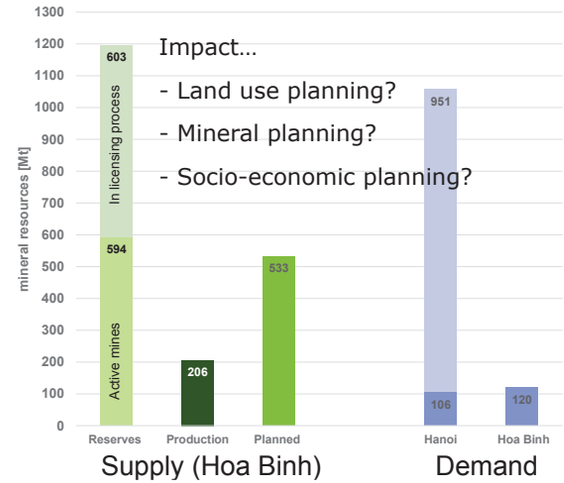
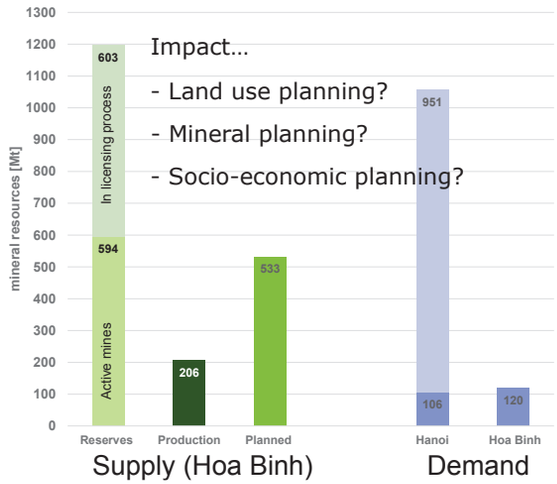
Demand and supply of mineral resources (2015-2030)



Demand and supply of mineral resources (2015-2030)



Demand and supply of mineral resources (2015-2030)



Impact…

- Land use planning?
- Mineral planning?
- Socio-economic planning?

Conclusion

Sustainable management of mineral resources needs

- Regional approaches
- Integrated approaches

→ Requirements for the MFA-approach

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Potential assessment of calculating material flows of construction materials from mining areas – Case studies for 3 types of mines in Luong Son, Hoa Binh

The report presents an initial potential approach on the calculation of material flows in mineral extraction for 3 types of mines (basalt, limestone, clays) in Luong Son district, Hoa Binh province. For the matter of material balance and the material flow analysis (MFA) respectively, such data are crucial which state the production potential, product yield, product quality (supply side), demand for using the type(s) of product, market, transfer locations (retailers, dealers), locations of direct consumption, consumption quantities (demand side). Moreover, the waste should be taken into account, especially quantities of wasted rocks and soil, waste dumps, the (specific) rate of waste per unit of product. Therefore, the collection and processing of input data for the calculation model is of decisive significance. Based on the current availability of the data of the case studies in Hoa Binh, the report presents three approaches to apply MFA, from simple to complex as well as pointing out the relevant issues for material flow analysis with regard to the mining sector of construction materials. The results of this report represents a subbranch within the MAREX project. MFA will be done in order to assess current and future demand for construction materials in Hoa Binh province and in Hanoi through the consideration of all relevant steps of resource consumption such as mining, processing, usage within the construction environment and recycling/disposal. These research results shall provide a scientific basis and a starting point to support discussion on issues related to material flows, aiming at further propose appropriate solutions toward the objectives of sustainable development in Hoa Binh province.

Prof. Dr. Hoang Xuan Co |
Dr. Pham Thi Viet Anh

The Research Centre for Environmental Monitoring and Modelling (CEMM)

Hanoi University of Science

German-Vietnamese Project: Management of mineral resource exploitation in Hoa Binh Province – a contribute for sustainable development in Vietnam (MAREX)

Potential assessment of calculating material flows of construction materials from mining areas
- Case studies for 3 types of mines in Luong Son, Hoa Binh -

By Prof. Dr. Hoang Xuan Co – Dr. Pham Thi Viet Anh
VNU University of Science

Dresden, 28/6/2016

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1. Benefits of MFA to mineral mining industry as building materials

- Determination of material flows (inputs, outputs, waste, waste reuse)
- Identify sources of waste generation, the ability to material losses
- Cause environmental pollution
- Identifying the needs of exploitation and the ability of provision
- Pointed out the weaknesses in management
- Create knowledge basis to propose appropriate solutions for improvement of the environment, production efficiency and rational use of resources
- Support for Better planning (a company which produces, region, ...)
- Reduce costs for companies.
- Contributing to sustainable development

2. Potential to apply MFA in the mining industry

2.1. Demand for data

- ✓ Types of data
- ✓ Purpose of data use
- ✓ Approach of data
- ✓ Check the reliability of data.

Material balance in mineral mining

- Production potential
- Product yield
- Quality products for supply
- Demand for use of the product

} Supply

- Consumer market
- Transfer locations (dealers/retails)
- Location for directly using products
- Quantity of products for use

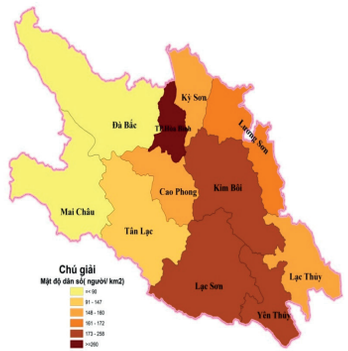
} Demand

- Quantity of Disposal of soils, waste dumps
- The proportion of waste rock per unit of product

} waste

ABILITY TO PROVIDE DATA FOR MFA PROBLEM IN MINING IN LUONG SON, HOA BINH

- ➢Number of mines silenced to operate: 38
- ➢Number of operating mines: 20
- Type of exploitation:
  Limestone
  Basalt
  Clay
- Survey
  - In general: 35 mining sites
  - In detail: 6 mining sites (physic sampling)
    - Hop Tien, Quang Long, Trung Son (3 casestudies of MAREX)
    - Song Da 11, Army, Khai Hung



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Type of information to be collected

- Coordinates
- Type of product
- Reserves
- Capacity
- Type of waste / volume / waste characteristics
- Waste management
- Implementation of commitments under the EIA

Available data from 3 companies as case studies: Hop tien, Quang Long, Trung Son

Table 1: Output at Hop Tien Co.

	Extraction site	Product type	Mine reserve (2015)	Product details		Output (2013) m3	Output (2014) m3	Output (2015) m3	Planned output (m3)
				product	Grain size (cm)				
Hop Tien	1	Basalt		Basalt	10-50	55.000	60.000	58.000	115.000
				Basalt	4-6				
				Basalt	2x4	15.000	16.000	14.000	
				Basalt	1x2	20.000	21.000	23.000	
				Basalt	0,75	5.000	4.000	10.000	
				Basalt	0-0,5				

Available data from 3 companies as case studies: Hop tien, Quang Long, Trung Son

Table 2: Output at Quang Long Co.

	Extraction site	Product type	Mine reserve (2015)	Product details		Output (2013) m3	Output (2014) m3	Output (2015) m3	Planned output (m3)
				product	Grain size (cm)				
Quang Long	1	• Basalt • Stones		Basalt	10-50	0	0	0	0
				Basalt	4-6	0	0	0	0
				Basalt	2x4	2000	3000	2500	2000
				Basalt	1x2	180000	190000	190000	195000
				Basalt	0,75	18000	15000	12500	13000
				Basalt	0-0,5	20000	12000	15000	10000

Available data from 3 companies as case studies: Hop tien, Quang Long, Trung Son

Table 3: Output at Trung Son Cement Plant

	Extraction site	Product type	Mine reserve (2015)	Product details		Output (2013) m3	Output (2014) m3	Output (2015) m3	Planned output (m3)
				product	Grain size (cm)				
Trung Son Cement Plant	2	• Basalt • Lime-stone for Cement production		Basalt	10-50	0	0	0	0
				Basalt	4-6	0	0	0	0
				Basalt	2x4	2000	3000	2500	2000
				Basalt	1x2	180000	190000	190000	195000
				Basalt	0,75	18000	15000	12500	13000
				Basalt	0-0,5	20000	12000	15000	10000

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Available data from 3 companies as case studies: Hop tien, Quang Long, Trung Son

Table 4. Purpose of usage

Tỉ lệ Sản phẩm (2015) được phân phối cho từng loại khách hàng (%)			Tỉ lệ sản phẩm (2015) phân bố trực tiếp được sử dụng cho mục đích...(%)					Khối lượng từ các hoạt động khai thác không được sử dụng, bỏ lại trong năm 2015)	Khối lượng từ các hoạt động khai thác không được sử dụng, bỏ lại (năm 2014)	Khối lượng khai thác không được sử dụng, bỏ lại (2015)	
Bán lẻ	Công ty vật liệu xây dựng	Công ty xây dựng	Xi măng	Trộn bê tông	Sử dụng cho làm đường	Sử dụng làm	Mục đích khác				
	x			x	x			0	0		> Hợp tiến
5	10			80	10			0	0		> Quang Long
		x	x	x	x		x	0	0	0	> Trung Sơn

Nhận xét: Không có đất đá thải bỏ được tái sử dụng ?

Available data from 3 companies as case studies: Hop tien, Quang Long, Trung Son

Table 5. Products delivered to customers outside Hoa Binh

Khối lượng bán cho khách hàng tại các tỉnh năm 2015												
Hoa Binh	Ha Noi	Son La	Phu Tho	Vinh Phuc	Thai Nguyen	Bac Giang	Bac Ninh	Hung Yen	Ha Nam	Ninh Binh	Thanh Hoa	
5%	95%											
10%	80%							5%	5 %			> Hợp tiến
30	35	5	12	15,4	1	0,5	0,5	0	0,5		0,1	> Quang Long > Trung Sơn

- Common Market is Hanoi
- Markets for Hop Tien, Quang Long: Hanoi (80-95%) and Hoa Binh
- Trung Son: 2 major markets are Hanoi (35%) and Hoa Binh (30%)
  Others: 25% (including 15% of Vinh Phuc)

2.3. MFA approach proposed to mineral mining industry as building material in Hoa Binh

Approach: From simple to complex

- Material flows from mining to consumption
- Material flows from a production facility (processing plant)
- Material flows at consumption place

Approach 1: Simple

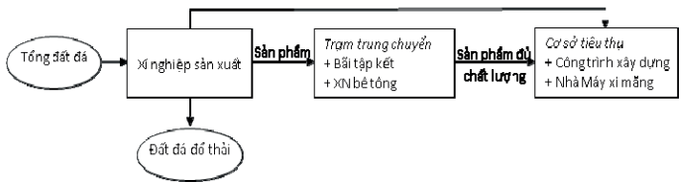

Figure 1- Diagram illustrates the material flows from mining sites to consumption

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Approach 2

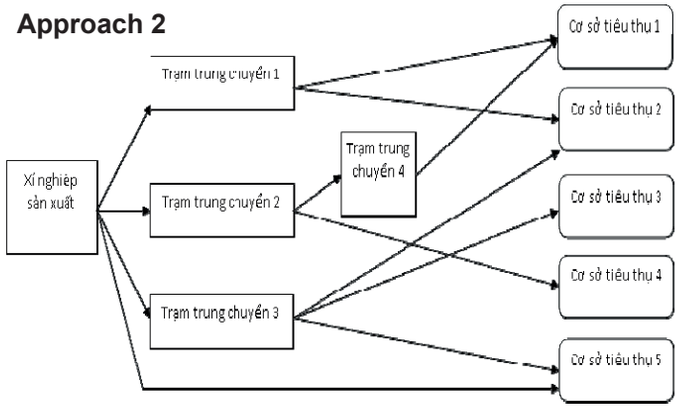
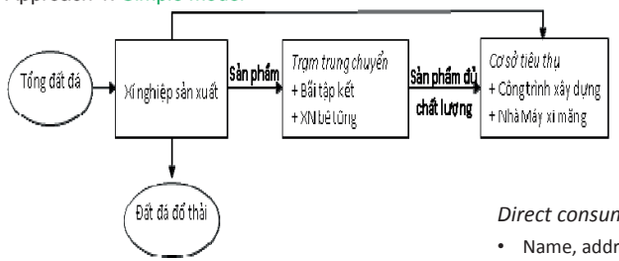


Figure 2: Diagram illustrating material flows from a production plant

Approach 1. Simple model



Data of facility

- The address, coordinates of production site
- Production technology
- annual total volume of rock for excavation and blasting
- Name and address of customers

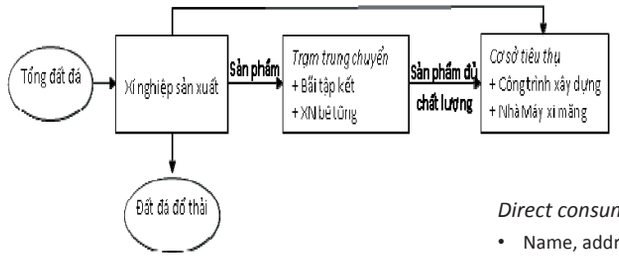
Information of transfer locations:

- Name, address, coordinates
- Scale (storable place, concrete production capacity, first dealers/ retails)
- Name and address of the next /sub consumer. Annual shipping volume to other facilities

Direct consumer base

- Name, address and coordinates grassroots
- Type of construction material used (traffic works, buildings, apartment ...)
- Scale of works/buidings
- Estimation of annual consumption of materials (work progress)
- Estimated time of completion of works

Approach 1. Simple model



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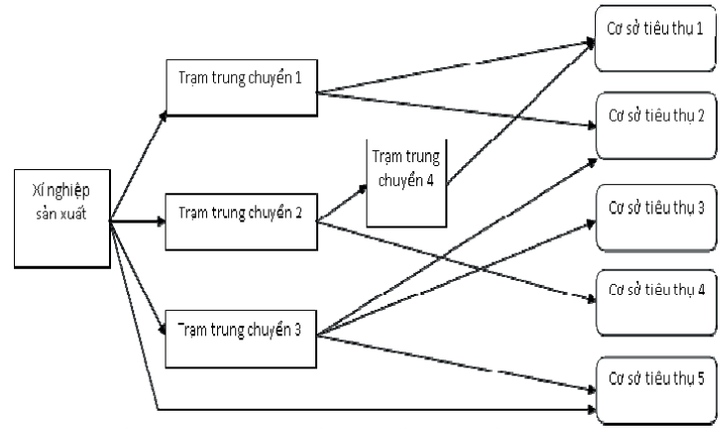
- Scale of works/buidings
- Estimation of annual consumption of materials (work progress)
- Estimated time of completion of works

By Prof. Dr. Hoang Xuan Co – Dr. Pham Thi Viet Anh
VNU University of Science

Approach 2: The material from a production site



Problem of material balance of 3 manufacturing facilities in Luong Son based on this approach

By Prof. Dr. Hoang Xuan Co – Dr. Pham Thi Viet Anh
VNU University of Science

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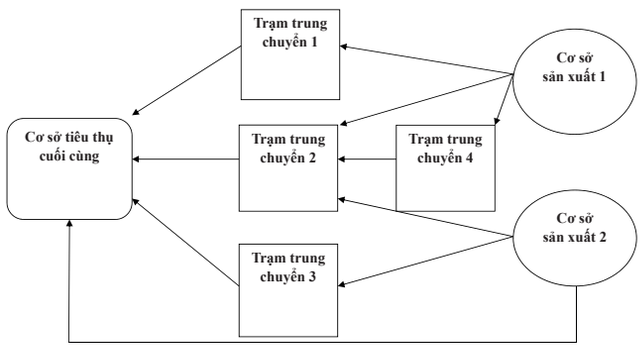
Approach 3: The material at the place of consumption



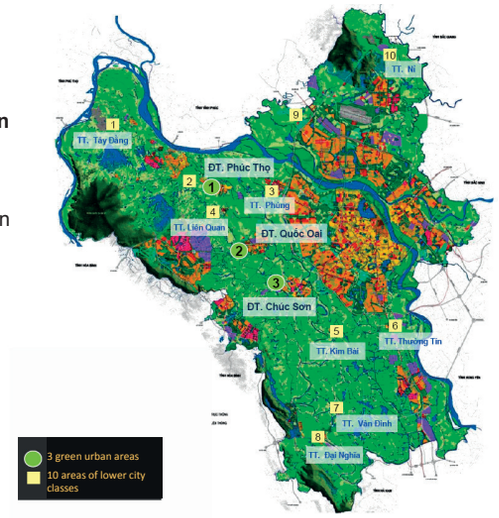
- Integrated approach of 1 and 2
- For forecast of demand and supply of building materials for a large area (such as a region)
- Large scope: Hanoi, Hoa Binh

By Prof. Dr. Hoang Xuan Co – Dr. Pham Thi Viet Anh
VNU University of Science

Ví dụ Quy hoạch đô thị thành phố Hà Nội

Overall planning of Hanoi up to 2030, vision to 2050

in 2030:
Population: 9.0-9,2 million
Urbanization rate: 68%
in 2050:
Population: 10.73 million
Urbanization rate: 70-80%



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The Example of planning for megacities of Nhat Tan, Hanoi

Demand for building materials will get stronger

3. Some issues to be considered when calculating the MFA for construction material mining industry in VN

1. Situation of providing data/information

- Statistical data: limited due to storage of data has not been focused
- Estimated cash flows can help to estimate material flow but hardly public by business
- Survey: incomplete data, lack of data
- Data source: mainly provided by facilities
- Difficulties in approach with data sources without writing official document by authorities
  Difficult to define specific material flow data from the production site to the final place of consumption (because of the present of transfer station)

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2. Issues needs considering when implementing MFA

A. For the problem of the current material flow : based on the approach of

- Need to determine the amount of building materials from the production (eg from Luong Son, Hoa Binh)
- Where to be processed and provide to
- Knowing material flow from transfer locations (dealers), we can approach direct and final consumption of material which is manufactured from the facilities in Luong Son

B. The Problem of models for forecasting building material balance

1. The forecasted data for supply and demand needs to be done

- ***For supply sources***:
  - Estimating available production supply of facilities through fieldwork, production plans according to the EIA report, ...
  - Forecasting data of production supply of facilities which will be built and operated in the future through geological data, their development plan
- ***For demand sources:***
  - More difficult to identify; survey in detail needs doing to get realiable data
  - Identifying survey areas (e.g.for building materials from Luong Son, just survey Hanoi area)
  - Identify the transfer locations (main dealers/sub-dealers/retails) and consumption locations
  - Knowing well the information about where the building materials come from
  - Annual consumption quantities/amount of materials
  - Development orientation in the coming years
  - Disadvantages: not easy to approach data sources from dealers/retails/final consumption customers.
- There should be a written official document from the administration for providing data

2. Identify input data for MFA based on Integration with the regional and regional development planning

- In the master planning of economic and society development of Hanoi up to 2020 and vision to 2030, programs and projects as priority investment has been showed in annex 4, including program of infrastructure development (transport, electricity, irrigation, ...); housing and urban development (new urban areas, satellite urban areas, renovated old buildings, ...); industrial and handicraft development with the new construction and renovation of industrial zones up to 2020 and orientations to 2030 as well as a number of other programs (indicated in detail in Annex 2).
- Demand for building materials will certainly be very high
- Based on building criteria's, evaluation of the needed amount of building materials for the implementation of the above program can be done.

3. Display data on digital maps (using GIS): Forecast demand for building materials and other needs to meet plan (require a big budget)

Thank you very much!

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Spatial planning and construction aggregates materials exploitation issues in Vietnam – Challenges in integrating towards environmental protection

Mineral mining in Vietnam is currently one problem industry causing environmental pollution that requires appropriate management solutions through the integration of construction planning (also known as physical planning, spatial planning) and environmental protection planning. The specific environmental provisions related to mineral mining as well as post-mining reclamation requirements are regulated by the Environmental Protection Law of 2014. The Ministry of Natural Resources and the Environment (MONRE) is the agency responsible for managing the environment, land and other natural resources. According to the Environmental Protection Law, any development plan (including construction planning) must be subject to a strategic environmental assessment. Furthermore, construction investment projects require separate environmental impact assessments. The new environmental protection law includes additional content on environmental protection planning projects with a focus on environmental issues. Meanwhile, land use management as well as long-term spatial development at various administrative levels from national to provincial as well as the local level are managed through construction planning schemes, subject to the Construction Law of 2015 and the Urban Planning Law of 2009 and managed by the Ministry of Construction. Many issues of construction planning addressed by these laws are related to urban development, spatial orientation, social infrastructure, technical infrastructure and the environment; in particular, planning schemes must integrate strategic environmental assessments. The fact that mineral mines are considered to be industrial zones means that insufficient attention is paid to the environmental impact as well as reclamation and rehabilitation over the long term. The Ministry of Construction has issued a master plan for the extraction of construction aggregates, which has been approved by the Prime Minister. However, this is merely a plan to exploit raw minerals for the production of construction materials. The state management of environmental protection policy would benefit from some integration between spatial planning and environmental planning, focusing on mineral mining for construction materials. This presentation will provide an overview of the construction planning system of Vietnam, environmental protection planning, strategic environmental assessment of construction planning and the environmental impact assessment of building investment projects. This will form a basis for the proposed integration between construction planning and environmental protection planning to address issues around aggregate mining (pilot case study in Hoa Binh province).

PhD. Arch. Luu Duc Minh

Institute for Environmental Planning and Urban-Rural Infrastructure (IRURE)

National Institute for Urban-Rural Planning (VIUP)

Ministry of Construction, Vietnam

Spatial planning and construction materials exploitation issues in Vietnam - Challenges in integrating towards environmental protection

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Institute for Environmental planning, Urban and Rural Infrastructure (IRURE),
Vietnam Institute for Urban and Rural Planning (VIUP)
Ministry of Construction of Viet Nam (MOC)

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LEGAL FRAMEWORK FOR PLANNING AND MANAGEMENT ON URBAN DEVELOPMENT IN VIETNAM

3

Introduction of Vietnam's urban system

Viet Nam has: 774 urban areas:

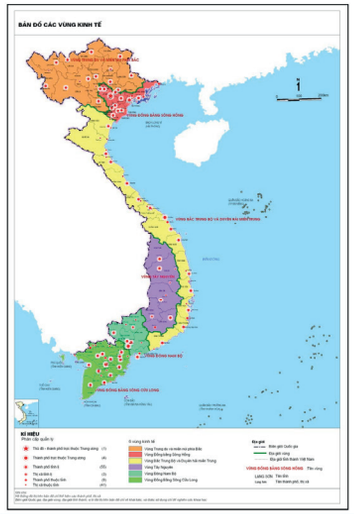
+Urban system is divided to 06 types
+ 02 special grades, 15 grades I, 14 grades II, etc.

Urbanization rate: **34%**

+ Average growth: 1% per year.

Total urban land area: 34,017km^2 (10.26% of the total natural land area in the whole country)

Total urbanized land area:14,760km^2 (4.42% of the total natural land area in the whole country)



4

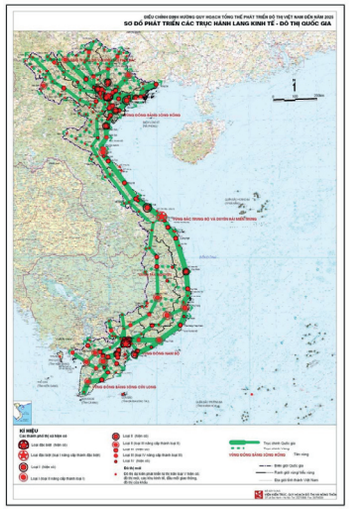
The national urban network planning orientation

The National urban network planning orientation until 2025 and vision to 2050

By 2025:

+ Total number of the urban areas: 1,000 incl. 17 special grades and grade I, 20 grades II and 81 grades III

+ Population in urban areas: 52 million taking up 50% of the whole country



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The system of legal documents on construction planning (before 2014)

Construction law in 2003

- **Decree 29/2007** on Urban architecture management
- **Decree 08/2005** on Construction planning
- **Decree 42/2009** on Urban classification

Urban planning law in 2009

- **Decree 37/2010** on Formulation, appraisal, approval and management of urban planning
- **Decree 38/2010** on Management of urban space, architecture and landscapes
- **Decree 39/2010** on Management of urban underground construction space

- The circular providing guidance for formulating, appraising, approving and managing construction planning
- The circular providing guidance formulating, appraising, approving and managing the construction planning of industrial parks and economic zones.
- The decision on the records of planning projects
- The decision on the signs in drawings
- The circular on rural construction planning

** Construction planning in Vietnam is understood as spatial planning or physical planning*

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Current legal documents system of urban planning & urban development (after 2014)

CONSTRUCTION LAW (Amended in 2014)

- **Decree no. 44/2015/NĐ-CP** on detailed regulations on construction planning

LAW ON URBAN PLANNING (enacted in 2009)

- **Decree no. 37 /2010/NĐ-CP** on the formulation, appraisal, approval, and management of urban planning.
- **Decree no. 38 /2010/NĐ-CP** On management of urban space, architecture and landscapes.
- **Decree no. 39 /2010/NĐ-CP** on management of urban underground construction space.
- **Decree no. 11 /2013/NĐ-CP** on the investment management of urban development

- **Circular 10/2010/TT-BXD:** Defining records of each urban planning
- **Circular 06/2013/TT-BXD and Circular 16/2013/TT-BXD:** Guidelines on urban design in urban planning.

Circular 12/2014/TT-BXD on the investment management of urban development

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Construction planning system in 2003
(According to Construction Law in 2003)

CONSTRUCTION PLANNING

- **Regional Construction Planning** (Provincial region, inter-provincial region, district region and inter-district region)
- **Urban Construction Planning**
  - **Urban construction general planning**
    - **Urban construction detailed plan (1/500-1/2000)**
- **Rural Residential Areas Planning**

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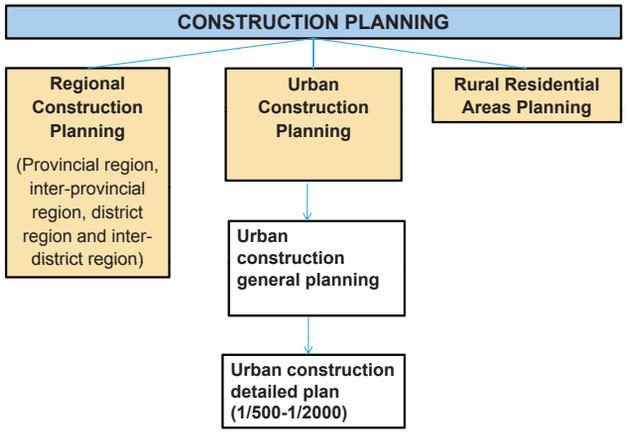
Construction planning system in 2003
(According to Construction Law in 2003)



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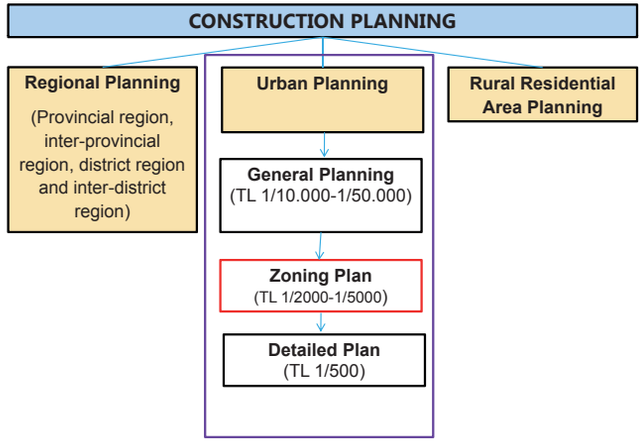
Construction planning system in 2009
(According to Construction Law in 2003, Law on Urban Planning in 2009)



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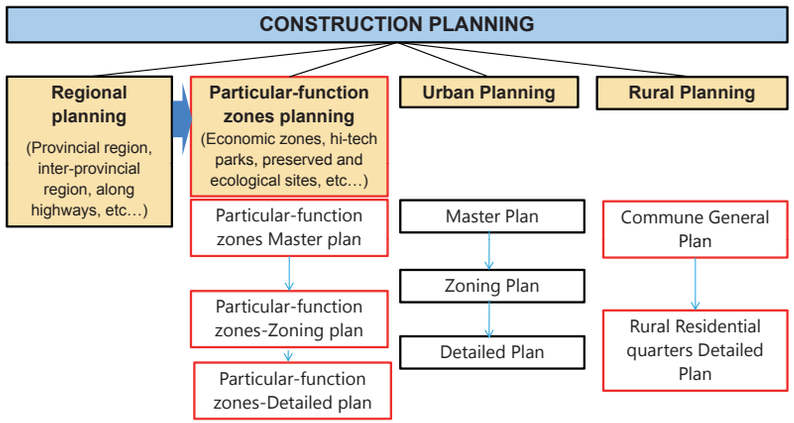
Current construction planning system
(According to Construction law in 2014 and Urban planning law in 2009)



Urban Planning System
(According to Law on urban planning in 2009)

Hanoi urban planning (Example)

Ha Noi Master Plan until 2030, vision to 2050

By 2030:

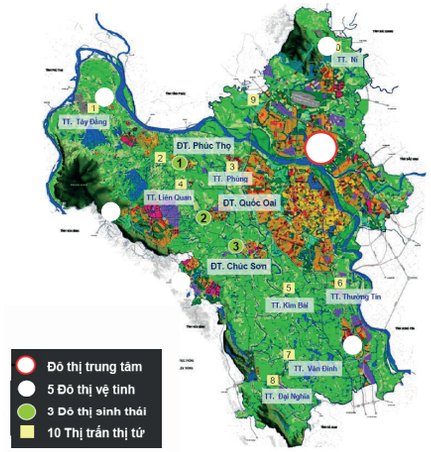
Population: 9.0-9.2 million

Urbanization rate: 68%

By 2050:

Population: 10.73 million

Urbanization rate: 70-80%



Hanoi urban planning (Example)

The zoning plan N4 - The central urban area of Ha Noi city

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Hanoi urban planning (Example)

Me Tri ecologic urban area detailed plan – Ha Noi city

Urban development investment management
(Decree 11/2013, Circular 12/2014)

Scope of adjustment: Adjusting every activities relating to urban development investment: Urban planning, investment, operation, exploitation, transfer of urban development projects.

The urban development areas include: New urban areas; Urban expansion; Urban renovation; Urban preservation; Redevelopment; Areas with special functions.

Within the competence of urban development areas

Prime Minister
- The urban development areas in the urban center whose master plan were formulated will be approved by Prime Minister (Cities under central management, provincial city grade I, etc...)
- The urban development areas belong to the administrative boundary of two provinces and above.
- The urban development areas are the new urban areas with their population size equivalent to the urban grade IV and above.
- The urban development areas play important roles in security and national defense

PPC of Provinces
- The remaining urban development areas

LEGAL FRAMEWORK FOR ENVIRONMENTAL PROTECTION IN PLANNING

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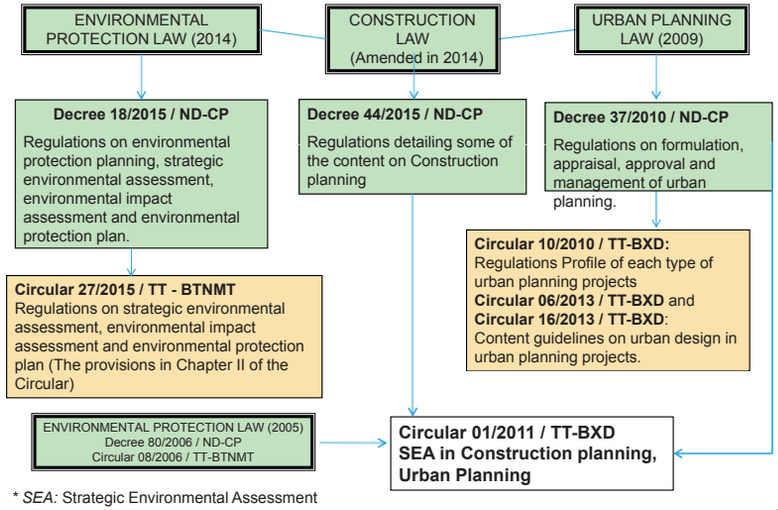
The legal framework for Environmental Protection planning



* *SEA:* Strategic Environmental Assessment

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The legal framework for Environmental Protection planning (Environmental Protection planning Law 2014)

The concept of "environmental planning"

- It is Environmental partitioning to preserve, develop and establish infrastructure associated with the system of Environmental Protection solution system, that is closely related with socio - economic development master plan to ensure sustainable development (Section 21, Article 3);

-**Principles of environmental protection planning (Section 1, Article 8)**

- In accordance with natural conditions, socio - economic, defense and security development master plan;

- Ensure consistency with land use planning; Consistency between the basic content of Environmental Protection Planning;

- Ensure environmental protection principles.

Planning duration:

Environmental protection planning period is 10 years, vision to 20 years (Section 2,3, Article 8).

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The content of Environmental Protection Planning (According to the Decree 18 / ND - CP dated 02/14/2015 - chapter 2)

1. Movements, environmental management objectives, forest, biodiversity conservation
2. Current status of the marine environment, islands, river basin and the solutions target the conservation and protection of natural resources and the marine environment, islands, river basins;
3. Situation of arising gas and air environment quality, objectives and planning solutions for the development activities with large emission sources;
4. Degradation status, soil pollution, objectives and measures for preventing degradation, soil pollution, environmental restoration of contaminated land degradation;
5. Water environment status, wastewater management objectives and solutions, and water environmental protection;
6. Collection status, handling and goals, solution of solid waste management activities, industrial and hazardous solid waste;
7. Status of monitoring networks and environmental monitoring, goals, orientated planning of monitoring system and environmental monitoring;
8. Environmental Partitioning under development objectives, protection, conservation and adaptation to climate change;
9. Prioritized environmental protection programs and projects, and environmental indicators;
10. Maps, diagrams related to regional planning;
11. Planning implementation resource of Environmental Protection, responsible for implementing and monitoring the implementation of environmental protection planning.

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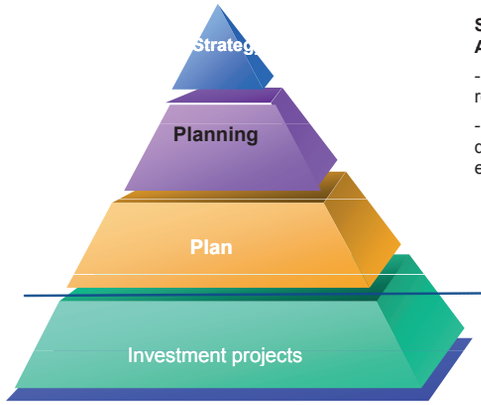
Relation of SEA and EIA



Strategic Environmental Assessment (SEA)

- Assess the impact of a strategic resonance, planning or plan
- Harmony between economic development, environment and society, ensure sustainable development

Environmental Impact Assessment (EIA)

- Environment impact assessment of a specific investment project
- Ensure that the process of implementing of the project meets environmental standards

** SEA: Strategic Environmental Assessment*
** EIA: Environmental Impact Assessment*

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Legal framework of SEA / EIA

- The concept of "SEA"

+ SEA is "to analyze and forecast the environment impact of the project strategy, planning, development plans to offer solutions to minimize adverse impacts on the environment, as the basis and is integrate in strategy, planning, development plans to ensure sustainable development goals" (**Section 22, Article 3, Environmental protection Law 2014)**

+ SEA is not only a technical tool but also as a method of management that plays an important role in environment protection of Construction planning and Urban planning **(In view of the MOC)**

+ SEA is a content of construction plan, to be carried out simultaneously in the process of the construction plan **(Section 1, Article 3, TT01 / 2011 / TT - BXD)**

- The concept of "EIA"

+ Environmental Impact Assessment is to analyze and forecast the environment impact of specific projects to make the environment protection measures when implementing such projects **(Section 23, Article 3, Environmental protection Law 2014)**

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The content of the SEA
(According to Circular 01/2011 / TT-BXD)

Environmental protection is integrated in Construction planning / Urban Planning through Strategic Environmental Assessment

1. Identify the key issues and environmental objectives related to the construction/ urban planning
2. Analysis of trends in the future without construction planning
3. Assess orientations and goals
4. Assess trends and important issues about the environment in construction/ urban planning
5. Identify priority issues in mitigation measures and the environmental monitoring mechanism

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Legal framework integrate environmental protection in construction planning and urban planning

The contents of all Construction planning projects must meet the approved planning tasks and specific requirements, including SEA. This is clearly stipulated in **Decree 44/2015 / ND-CP** stipulating in detail a number of contents on Construction planning, including:

- Section 1, Article 8: For the Construction planning

- Section 2, Article 12- 14: For General Planning, Regional Planning, Detailed planning projects build specific functional areas

- Section 3, Article 18-19: For Construction general planning project and Construction detailed planning project on rural residential area

Content of SEA in Construction planning projects are concretized include the following:

- Identify the main environmental issues within and outside the planning area

- The current status of pollution sources have directly affected the environment in planning area

- The forecast for environmental changes in the process of planning and implementation.

- Propose preventive measures and priorities for implementation; propose isolated areas, environmental protection

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Legal framework integrate environmental protection in construction planning and urban planning

In urban planning, projects also consist SEA in planning content. This is clearly stipulated in the articles include: **Decree 37/2010 / ND-CP on the formulation, appraisal, approval and management of urban planning**, including:

- Article 15: For General Planning of centrally run cities and towns, grade V not recognized as towns
- Article 16: For General Planning provincial cities, towns and General Planning new urban areas
- Article 19: For Regional Planning projects
- Article 20: For Detailed planning projects
- Article 22 - 30: For planning projects of technical infrastructure

SEA in Urban Planning projects are concretized consists the following contents:

- Assess current status of the environment: urban natural environment, environmental quality, socio-economic issues
- Analysis and forecast positive and negative impacts on socio-economic development and urban environment; proposed system of environmental protection criteria to offer solutions for orientations spatial development and infrastructure optimization.
- Set out the overall solution to prevent, mitigate and overcome the impacts and risks to the population; natural ecosystems; water, air, noise when implementing urban planning.
- Programming, environmental monitoring plan in engineering, management and environmental monitoring.

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LEVEL OF CONCERN IN ENVIRONMENTAL PROTECTION IN HOA BINH REGIONAL PLANNING

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Scope of Hoa Binh Regional Planning

Hoa Binh Province has an area of 459,635.15 hectares of natural and 793 471 inhabitants; 11 administrative units attached, including 10 districts; Lac Thuy, Kim Boi, Luong Son, Ky Son, Da Bac, Mai Chau and Cao Phong, Tan Lac, Lac Son, Yen Thuy and Hoa Binh city, is bounded as follows:

- North borders with Phu Tho Province;
- South borders with Ha Nam and Ninh Binh Provinces;
- East borders with Hanoi Capital;
- West borders with Son La and Thanh Hoa Provinces.

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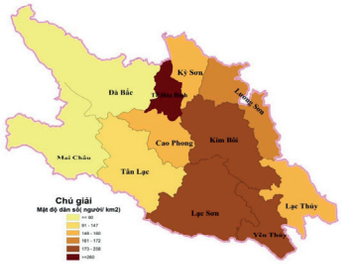
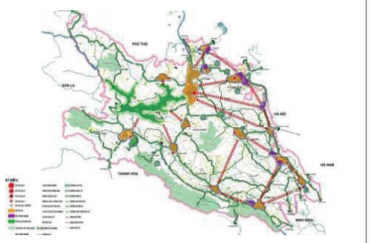
Content of Hoa Binh Regional Planning

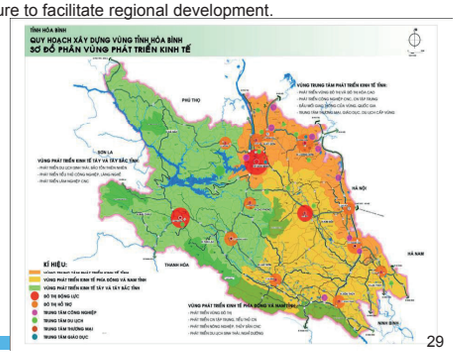
- Assess the current status of the natural, economic - social conditions; identify regional development motivation.
- Identify urban systems, residential areas; industrial, agricultural, forestry, fisheries and tourist areas; the heritage protection areas, natural landscape, cultural and historical sites; the restricted construction and reserved for developing areas.
- Identify network, location, scales of regional or inter-regional infrastructural headworks (Transportation, construction platform, rain drainage, power supply, water supply, communications, wastewater drainage, solid waste, cemeteries).
- Expect the developed-priority sections and resources for implementation.
- Forecast regional environmental impacts and propose measures to mitigate adverse environmental impacts of regional construction planning project.



Spatial development orientation

Regional development model is integrated economic development region includes high-tech industry, cultural-eco tourism, trade and service, education and training, and Agriculture-Forestry-Fishery around nuclear towns at provincial, regional and typical urban levels.
Economic development associated with main potential areas such as urban centers, Hoa Binh City, Luong Son and Ky Son Town, Mai Chau tourist area, Hoa Binh reservoir bed tourist area, Cuc Phuong National Forest, the natural reserve zone.
Economic development corridor is formed by the predominant economic development Ky Son - Luong Son - Lac Thuy: Range corridor adjacent to Hanoi along with Ho Chi Minh route with the land is flat, wide, densely populated; good traffic and infrastructure to facilitate regional development.





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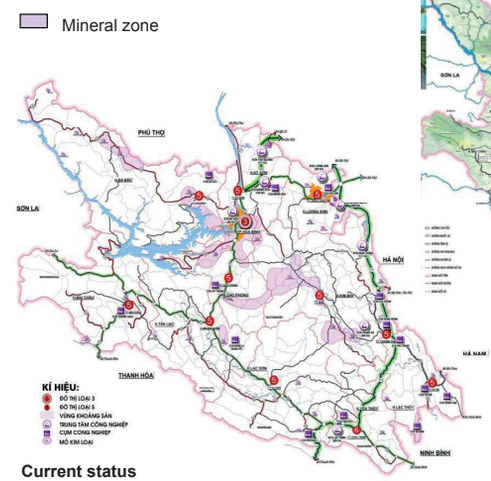
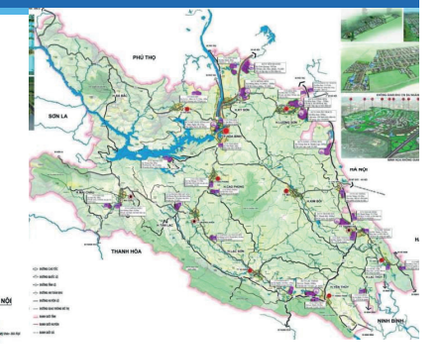
Develop economic growth centers - Industrial zones



Current status



Orientation

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Orientated development for industrial and mining zones

+To 2015 phase: Planning completion, site clearance, infrastructure investment and invested attraction in 7 industrial zones: Luong Son industrial zone - 230 hectares, Yen Quang industrial zone - 200 hectares, Nam Luong Son industrial zone - 200 hectares, Nhuan Trach industrial zone - 200 hectares (Luong Son district), left Song Da industrial zone - 86 ha (Hoa Binh City), Mong Hoa industrial zone - 200 hectares (Ky Son), Lac Thinh industrial zone - 200 hectares (Yen Thuy district), built industrial clusters along the Ho Chi Minh route.

+ 2016-2020 phase: Plan and build new infrastructure of industrial zones: Thanh Ha industrial zone - 300 hectares (Lac Thuy district). In case of continuing to research, build Dong Tam industrial zone (Lac Thuy district), Dam Duong industrial zone (Lac Son district).

Focus on building industrial clusters in districts along the route Ho Chi Minh. Attract investment projects to fill 70-80% of the land for industrial zones.

In which, the industrial zone of Nam Luong Son, Thanh Ha, Lac Thinh attract different types of consumer goods industry using many labors; industries of textile, footwear, agricultural and forest product processing for export, **mining and building materials manufacturing industry are suitable for mineral potential of each region.**

Environmental protection issues in Hoa Binh Regional Planning

SEA report content in Hoa Binh provincial region planning

1. Assess environmental current status in the study area

2. Forecast trend of environmental problems due to the impact of urban distribution, population, economic activities, infrastructure networks in the region; mention environmental issues that is resolved and unresolved in the planning project

3. Recommend environmental protection solutions according to developed region.

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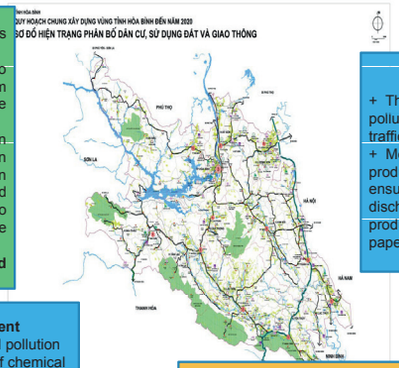
Assess environmental current status

Water Environment
+ The quality of the province's groundwater is still good
+ Surface water pollution tends to increase due to wastewater from industrial activities, agriculture and daily life.
+ sewage treatment systems in many industrial zones, urban area, mining has not been adequate attention, untreated wastewater before discharge into the environment or are preliminary.
⟹ **Water pollution in Da and Ma River**



Air environment
+ The sources of air pollution is mainly caused by traffic activity caused
+ Most of the industrial production facilities does not ensure the regulations on discharge, typically in the production facilities of stone, paper, cement, etc.

Soil environment
+ Soil degradation and pollution due to excessive use of chemical fertilizers, drugs stimulate the growth and cultivation to expand land bank
+ Occurred flooding and landslides in the reservoir bed when the Hoa Binh hydropower plant go into water accumulation

Ecological environment
+ Biological Diversity is relatively high, fairly typical
+ Biodiversity, especially forest ecosystems severely degraded in recent years

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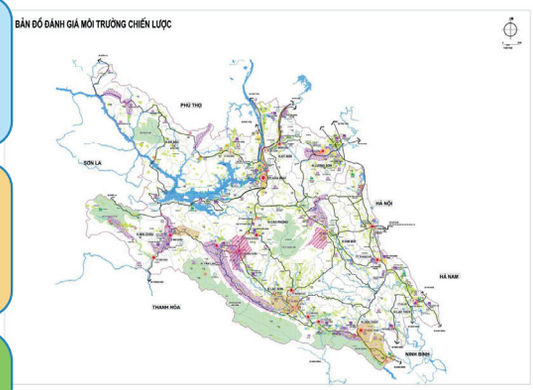
Forecast trends, environmental changes in planning area

Depletion of water resources
+ Increased risk of water shortage due to rising domestic demand and the impact of climate change
+ Water quality in rivers tend to deteriorate due to increased waste and weaken self-cleaning ability

Degradation of land resources
+ Due to the socio-economic development activities, particularly agriculture
+ Accumulation of pollution and land degradation in the area specializing in agriculture
+ Pollution, land degradation in the region landfill, cemetery

Increasedwaste
+ Increase the amount of wastewater and household solid waste due to population growth;
+ Increase the amount of industrial solid waste, particularly hazardous waste;
+ Increase dredging sludge and sewage treatment at one point;
+ Pressure from household solid waste, livestock, fertilizer residues, plant protection drugs



Change in biodiversity
+ Raise forest cover to 50% by the development of protection forests and special-use forests and production forests;
+ The risk of forest fires, destruction of biodiversity due to increased drought in the dry season.

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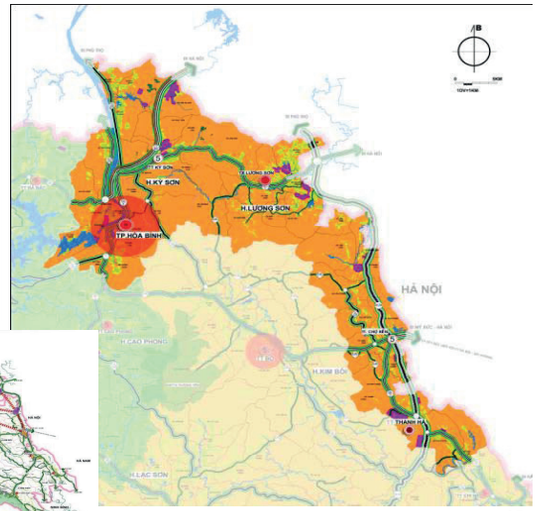
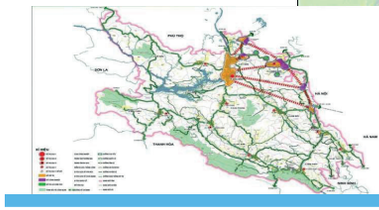
Environmental protection solution proposed in the plan

Center City area include Hoa Binh - Ky Son - Luong Son - Bac Lac Thuy: need rational use of land resources in urban development, minimizing conflicts social environment in the urban development process.





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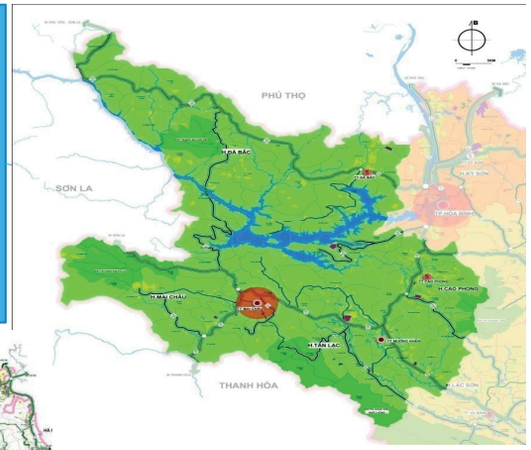
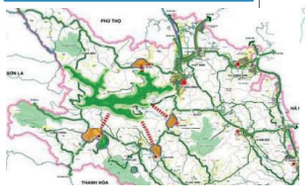
Environmental protection solution proposed in the plan

West & NorthWest areas including Mai Chau, Da Bac, Tan Lac, Cao Phong districts:

Strengthening on development & investment together with forest preservation, ensuring sustainable ecology for whole province.





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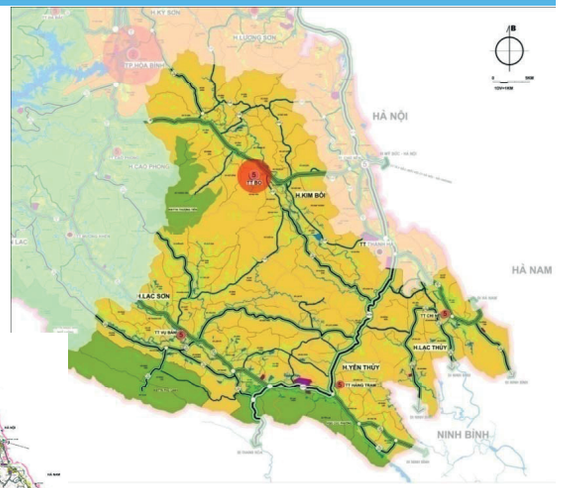
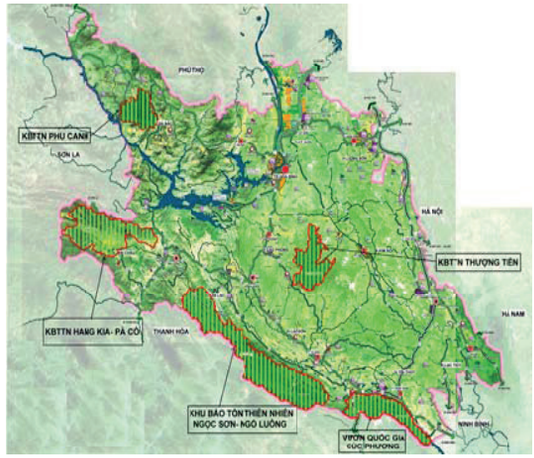
Environmental protection solution proposed in the plan

Eastern and southern province including Kim Boi, Lac Thuy, Yen Thuy, Lac Son districts.
When industrial development in this area, it should take full calculation solutions for each area drainage and build its own drainage system for wastewater and rainwater.



Environmental protection solution proposed in the plan

-For the natural landscape protection zone (nature reserve zone such as Hang Kia - Pa Co, Thuong Tien - Kim Boi, Phu Canh - Da Bac, Ngoc Son - Ngo Luong, etc.), only allows developing low density eco-tourism,construction not affect the biodiversity of the forest flora.



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Environmental protection issues in Hoa Binh Regional Planning

Limitations of SEA report in Hoa Binh Provincial region planning:

- The report has not forecasted yet environmental impact assessment in mining operations and construction materials production that is taking place is quite strong in Hoa Binh (air and soil pollution, biodiversity decrease, environmental disasters, etc.)

- There are not suggestion of environmental protection solution for mining zone and construction material manufacturing.

Further studies

Challenges in integrating environmental protection towards: Spatial planning and building materials exploitation issues

-The connection between the Environmental Protection Planning with Construction planning/ Urban Planning

-Content adjustment in Environmental Assessment Strategies in Construction planning under the Environmental Protection Law 2014

-Comprehensive renovation of urban planning in Vietnam towards integrated planning

- Mining problems of building materials should be more concerned (the relationship of supply and demand, economic-social development motivation, land use planning, spatial orientation, infrastructure and environmental impact changes, etc.) in construction planning solutions and not just in respect of environmental protection.

Further studies

Challenges in integrating environmental protection towards:
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THANK YOU !

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Collaboration of business and policy actors in the extraction of near-surface materials for the construction industry

Governments are responsible for developing specific policies that provide adequate conditions for the extraction of non-renewable resources. Among the main objectives, policies should include plans to ensure resource availability, to protect resources, minimize social conflicts and control environmental impacts. The practical application of these policies as well as policies towards sustainable development requires that all relevant stakeholders involved in the process of extraction and use of non-renewable resources (the government, industry, public, and non-governmental organizations) assume certain responsibilities (Langer et al. 2003). A wise management of aggregate resources is crucial to ensure sustainable urban and regional development. However, such management has only been implemented in a handful of countries and regions. Often there are practically no guidelines for the aggregate industry to follow, and the implementation of existing rules and regulations is rather weak (Langer and Tucker 2013). Against this background, the MAREX project proposes establishing a Business-Policy Interface (BPI) in the Hoa Binh Province of Vietnam as a pilot initiative for planning and managing the sustainable extraction of aggregates. The BPI is designed to be a collaborative platform and roundtable discussion constituted by the different stakeholders representing all the various interests involved in or affected by aggregate mining. It focuses on the identification of (potential) areas of extraction, public and private involvement, forecasting and monitoring of impacts on regional development and the environment, and the dissemination and enforcement of adequate extraction techniques and technologies. The purpose of the presentation is to introduce the concept, objectives and tasks associated with the BPI implementation in the Hoa Binh province of Vietnam. The presentation is expected to provoke discussion on the appropriateness, applicability and fine-tuning of the concept.

Prof. Dr. Bernhard Müller | Dr. Paulina Schiappacasse | Dr. Peter Wirth

TU Dresden / Leibniz Institute of Ecological Urban and Regional Development (IOER)

Collaboration of business and policy actors in the extraction of near-surface materials for the construction industry

Bernhard Müller, Paulina Schiappacasse, Peter Wirth

1.

Dear ladies and gentlemen, dear colleagues,

I would like to start with some of my own experiences: As a young scientist in the 1980s – that means more than 30 years ago – I was involved in a study of regional planning in Bavaria/southern Germany. One of the topics was the definition of potential areas for the extraction of near-surface raw materials for the building industry, especially gravel and sand. This dealt with the question of how regional planning defines priority areas and how the different interests of the construction industry, local interests and natural protection can be harmonized.

At that time, many local authorities complained about the problems caused by the extraction of sand and gravel. For instance, they couldn't use potential areas for raw material extraction as land for new construction. Furthermore, with the start of mining operation, farmers lost fertile soil. Last but not least, several environmental problems emerged, such as additional heavy trucking, dust emissions and impacts on the ground and surface water. Often natural and landscape protection areas were affected. Entire landscapes and mountains were changed or even disappeared through the extraction of mineral resources. Habitats and species were damaged or lost.

This situation was a wake-up call for environmental and natural protection associations. They organized resistance against the extraction of raw materials such as gravel, sand, sandstone, limestone, granite and basalt. In regions with high attractiveness for regeneration, the tourist industry also fought against mining activities.

On the other hand, there were also the legitimate interests of the construction industry, the stone-and-quarry industry and the owners of the quarries. Urban development needs raw materials for the construction of buildings and streets, and due to the high transport costs of bulk materials, the sources of sand and gravel should be close to the places of consumption.

At that time, I was impressed by how regional planners worked with dedication to tackle the problem and align the interests of the extraction industry, local authorities and nature protection. They initiated a close cooperation between the various interest groups, and guiding principles were elaborated on a voluntary basis. Finally, the parties decided to work on the basis of concepts guaranteeing an ecologically sound extraction process and recultivation measures after the end of mining in line with principles of natural protection, for instance the creation of new habitats and attractive landscape forms.

From the planners' point of view, this led to a practical system of sites assigned for the future extraction of raw materials for the construction industry. This system encompasses two planning categories, namely "priority areas" (Vorranggebiete), which are sites dedicated to the extraction of raw materials and where no other form of land form is allowed to undermine this primary use. On the other hand, "reserve areas" (Vorbehaltsgebiete) are sites where the final decision on future use has not yet been made, and where other land use and protection interests exist. Specifically, this means that when a concrete demand arises to use an area for mining, a planning process must be launched to examine whether the extraction of gravel and sand can be reconciled with environmental concerns and in relation to other land use requirements in the neighborhood.

Of course, such a system of priority and reserve areas is founded on a long-term process of cooperation and confidence-building process by all those involved. Here the regional planning agencies played the role of facilitators and "honest brokers" to a range of highly conflicting interests. Today all this is largely standard, coordination between different interests is good practice and procedures have been tested. The system is generally accepted and is rarely even explicitly commented upon. The example shows that with good communication and the goodwill of all parties, it is possible to find future-oriented and sustainable solutions for the excavation of near-surface materials for the construction industry.

To realize such an approach, there are three important aspects:

- Firstly, a communication and coordination platform must exist to ensure a balance of interests. This is not easily created. Here cooperation between government and business is needed.

- Secondly, active promoters are necessary to ensure that all voices are heard. These must be "honest brokers", figures who understand and have essential knowledge of both "worlds": on the one hand, the world of politics and administration, the "common good", communities, the environment and the people affected. And, on the other hand, the world of business and the compa-nies involved, as well as the construction industry as a whole.

- Thirdly, binding agreements and specifications must be set out which all stakeholders are required to obey. As noted in the example of regional plans, the logical consequence is to stipulate these in development plans.

All this encourages me to believe that further improvements are possible, also in Vietnam. I believe that the provincial government, the executive authority at the regional level, can well perform this role of an "honest broker" in the future even more strongly than before. I am also optimistic that the provincial authorities can work to promote those interests less vocally supported by actors or stakeholders, for example with regard to the massive landscape changes in the region and the after-use of mining sites. Specifically, we are thinking of a platform for cooperation between business, politics and administration, for a reconciliation of interests related to the exploitation of near-surface materials for the construction industry. We call this the MAREX Business-Policy Interface.

2.

What makes up such a platform? It has many responsibilities. For example, to support the provincial government in its decisions and give the companies certainty of action. For the other parties, it ensures that their interests are heard and taken into account. Such a platform brings all interests together. The participants meet regularly and are regularly involved in decisions. Guiding subjects are the raw material needs of the construction industry as well as market forecasts. Potential future extraction sites are discussed. The platform also plays a role in mining permits: The concrete needs have to be analyzed, ways to reduce the environmental impact have to be discussed and specific actions of stakeholders have to be agreed. Furthermore, the positive and negative economic and social impacts are placed on the agenda. Though conclusions of the discussions are "only" passed on as recommendations, it is advisable to consider such recommendations in decision-making.

If I describe the platform in a more structured way, the following five aspects stand out:

- Firstly, the aim of the business policy interface is to provide a platform for cooperation between business, politics and administration. The platform should also be open to other actors representing important interests, for example the affected communities or environmental groups, and other civil society initiatives.

- Secondly, the platform may have a formal character, but can also be orga-nized as an informal body. It is important that – at the end of deliberations – formal agreements are concluded, which are useful as recommendations for respective decisions.

- Thirdly, the platform needs a capable, active and well trained moderator who can mediate between the different interests. S/he should be well versed in the subject and enjoy the confidence of all sides.

- Fourthly, the parties should agree from the start on rules of communication. Such agreements, for example in the form of "rules of procedure", contribute to a fair and reliable process. But they should also be sufficiently flexible and applicable to a range of situations.

- Fifthly, a minimum set of tasks should be defined. This could include the following four fields of activity: (1) the identification and spatial definition of potential mining areas, (2) the organization of participation and the consideration of all important interests, (3) consideration of the impacts of raw material exploitation on regional development

and on the environment, and (4) the provision of assistance and advice, for example with regard to the longterm extraction concepts and the extraction and processing technologies used in the quarries and in the transport sector.

3.

What does this mean for our project? This leads us to the third and final part of my presentation. It should be stressed that the proposal to establish the described platform is at the moment really just that: a proposal. It needs to be discussed with our Vietnamese partners in detail. We have developed it using our knowledge and the analyses done in Vietnam, but here we are far away from Vietnam and the proposal now needs your feedback to get a better foundation.

The platform is also highly useful for the MAREX project. It provides a base to bring together the three other modules of the project: a) the description of environmental problems resulting from near-surface raw materials extraction and its monitoring; b) the use of environmentally sound and future-oriented mining technologies; and c) better methods to estimate the market potential of sand and gravel and the demand for construction materials.

Against this background, we propose the following six steps to establish the Business-Policy Interface:

- Firstly, we need to continue working on the problem analysis. The aim is to identify and to systematically analyze the challenges and issues related to the mining of raw materials for the construction industry.

- Secondly, we know that actors play the decisive role. Therefore, the aim is to identify the key actors and their interests.

- Thirdly, conflict analysis must play a role. The conflicts of interest must be identified and analyzed.

- The fourth point is about process analysis. Potentials for improvement must be detected regarding the current planning and approval procedures, the exploitation processes and the arrangements for post-mining development. This includes the search for a consensus between the different interests for a sustainable and environmentally friendly exploitation of raw materials.

- The fifth aspect is the mechanisms of cooperation between actors, starting with planning and approval, including exploitation control and ending with the after-use of mining sites.

- The sixth and final aspect is the question of how to model a platform for cooperation between business, politics and administration and what effect this has.

Thank you very much for your attention!

Boundary conditions, challenges and solution approaches for stakeholder communication in the process of post-mining land use planning in Vietnam (Project RAME, Province Quang Ninh)

The peninsula of Hon Gai, which is under the administration of the city of Ha Long in Quang Ninh (a province of Vietnam), is characterized by various land uses in a limited space. Consequently, when striving to achieve sustainable urban development, the city has the challenge of coping with a number of conflicting land uses ranging from coal mining to the urban environment, from nature conservation to tourism. Significant changes are emerging due to the transition from open-cast mining to underground mining over the next 5 to 10 years. In particular, former mining areas will become available for alternative forms of land use (post-mining). In the sub-project VIa, the project RAME has developed options to utilize post-mining areas under the title "Methods of planning environment-friendly post-mining land use" (2012-2015). This project, funded by the BMBF (FKZ 02WB1251), uses the example of the situation of the mining region of Hon Gai. The planning conditions for post-mining land use are the result of different spatial plans in Vietnam:

- Socio-economic development planning (MPI), spatial regional and urban planning (MoC) as well as land-use planning (MoNRE) as comprehensive general plans;
- Environment planning (MoNRE) and mining planning (MoIT, VINACOMIN) as sectoral plans.

The RAME project has collaborated with a long-standing project partner, VINACOMIN, to realize the task of setting up a methodological study on post-mining land use.

The main task is to integrate the planning conditions prescribed in the aforementioned spatial plans as well as engaging various stakeholders and providing suitable space for their participation in the course of the planning process.

Clearly, stakeholder consultation is a necessary condition for developing a coherent and integrated post-mining development plan. Successful consultation requires the following steps:

- Mediating between different planning cultures
- Investigating the specific interests and motivations of stakeholders
- Defining spatial planning units
- Implementing the planning system in GIS along with vivid 2D and 3D visualization (different temporal states, planning conflicts, etc.)
- Holding interviews and workshops with stakeholders
- Presentation of specific solution approaches to get feedback
- Integration of existing plans
- Roadmap for mining closure and reuse of land

Dr.-Ing. Katrin Broemme

Environmental Engineering+ Ecology

Prof. Dr. H. Stolpe

Ruhr University of Bochum

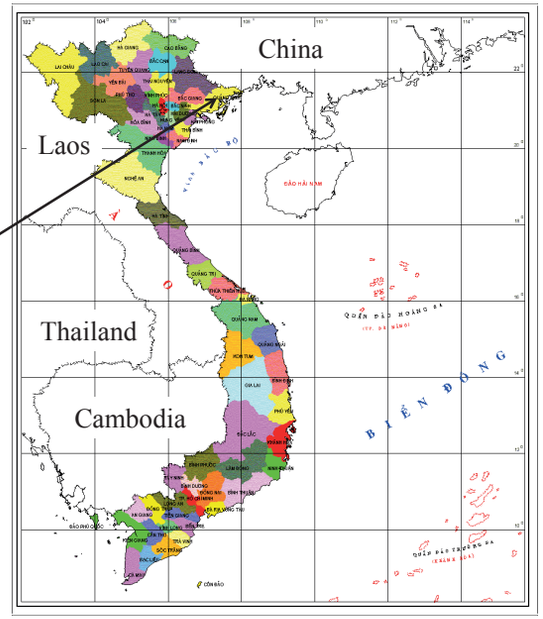
Boundary conditions, challenges and solution approaches for stakeholder communication in the process of post-mining land use planning in Vietnam (Project RAME, Province Quang Ninh)

K. Brömme, H. Stolpe

eE+E Environmental Engineering+Ecology
Prof. Dr. H. Stolpe
Ruhr University of Bochum
www.rub.de/ecology
www.rame.vn

Project area:

Quang Ninh



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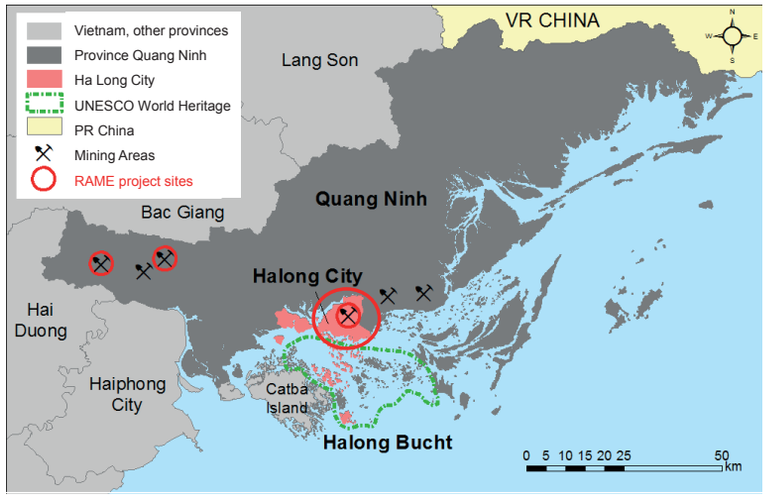
Quang Ninh

- Total area: 5,900 km²
- Province capital: Ha Long City
- 1.2 million inhabitants, ~180 people/km²
- Total area of hardcoal mining ~350 km²
- 95% of the national hardcoal production, at the same time popular tourist destination Ha Long Bay
- Mining since 1840, ~175 years
- VINACOMIN (Vietnam National Coal and Mineral Industries Group) is the biggest employer of the region
- Other economic sectors: tourism, construction materials, seafood, trade

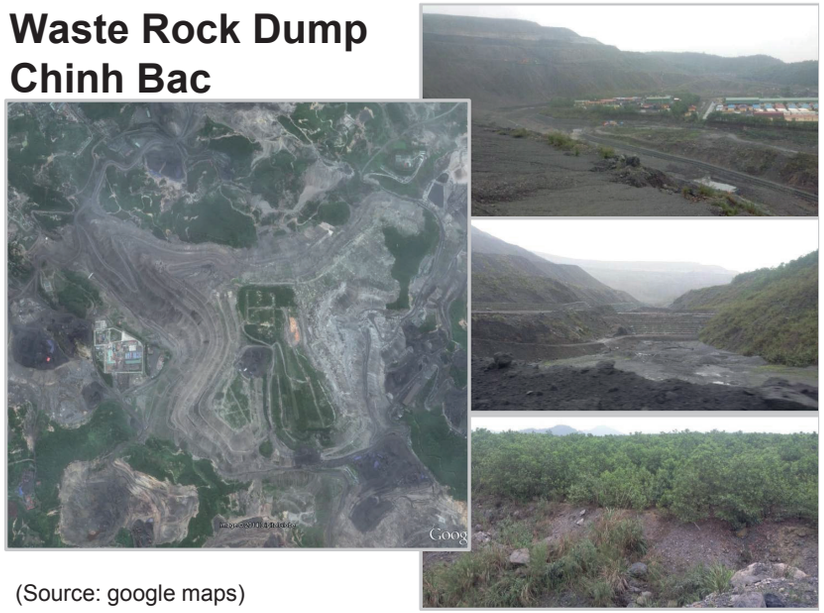
Project area: Hon Gai



Hardcoal Mining

- High quality Anthracite coal (7200-8300 Kcal/kg, max. 0.6% sulphur, 3-12% ash content)
- 50% open pit mining (decreasing), 50% underground mining (increasing), ~ 30 coal companies
- Management by VINACOMIN (before: VINACOAL) since 1995
- Explored reserves ~ 3,5 Mrd. t
- Production rate: 45 Mio. t / year (2015)
- Domestic use for thermal energy production, cement and fertilizer production
- Coal export to Japan, China etc.

Waste Rock Dump Chinh Bac



(Source: google maps)

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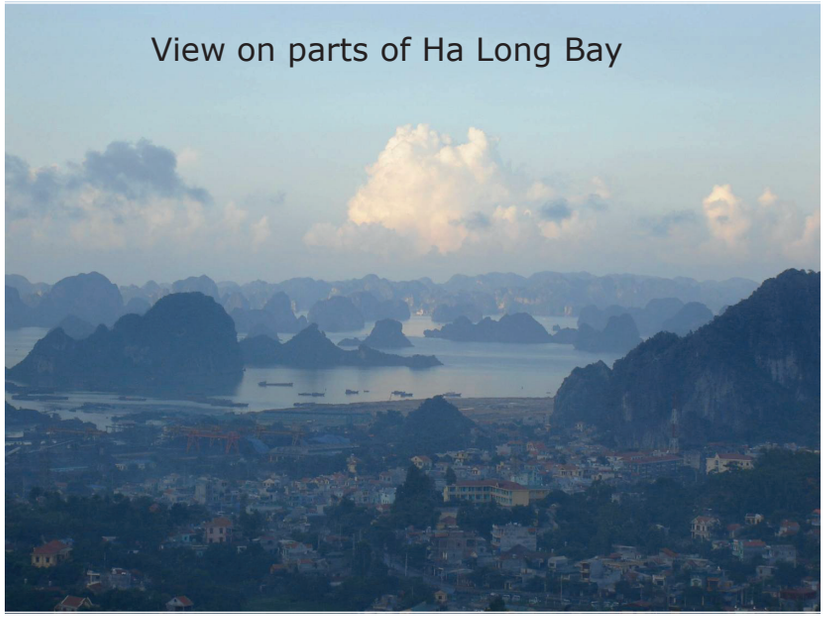
Open pit mine Nui Beo

(Source: google maps)

Waste Rock Dump Nam Lo Phong

(Source: google maps)



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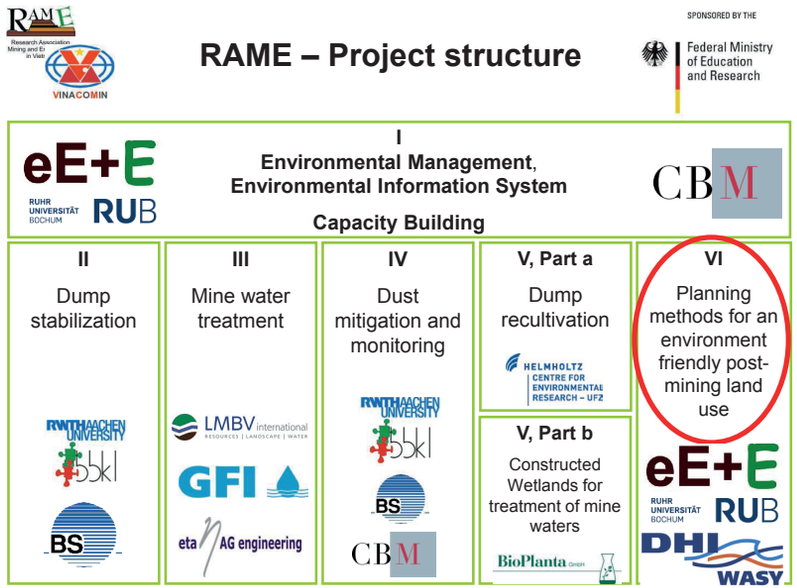
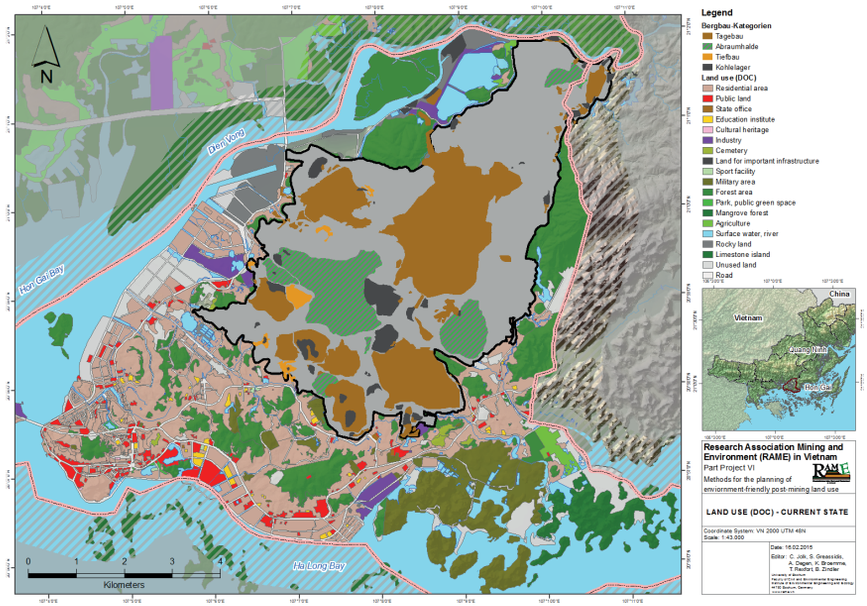
Background RAME

- Environmental issues in 2004: untreated mine waters, unstable waste rock dumps, no recultivation, high dust pollution etc.
- 2004: first inquiry by VINACOMIN
- 2005: establishment of RAME Research Association Mining and Environment
- 2005-2006: Pre-feasibility study
- Since 2005: Project office at VINACOMIN in Hanoi
- 2007-2013: Technical sub-projects
- 2011-2015: Sub-project on post-mining land use



Initial situation 2010

- Mining area Hon Gai:
  - Part of Ha Long City
  - Open pit mining technology prevailing
  - Mining areas adjoin residential areas
  - Conflicts due to emissions (dust, noise, vibrations, mine water), slope sliding and mine subsidences
  - Different mines and mining companies, mostly under VINACOMIN



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Initial Situation 2010

- Agreement between VINACOMIN and the provincial government: continued operation of large open pit mines for a limited period, stepwise transition to underground mine technology
- Legal obligation to perform an environmental rehabilitation after mining
- Need for an integrated post-mining land use planning due to location in a densely used urban area

Approach

System analysis
- Baseline survey, Data processing
- Relevant framework conditions for planning, stakeholder
- Investigation area, planning area in current state
- Investigation area, planning area in future state

Post-mining land use planning
- Delimitation of spatial planning units
- Development goals for the post-mining land use planning
- Regional plan for post-mining land use
- Detailed plan for post-mining land use

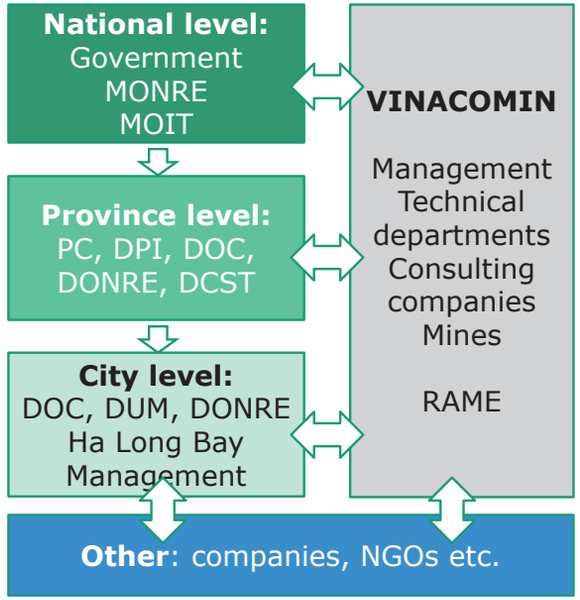
Testing and Modification
- Remaining issues / Planning conflicts
- Roadmap design for post-mining land use

Integrated Plan for Post-Mining Land Use
- Regional plan for post-mining land use
- Detailed plan for post-mining land use

Stakeholder communication

Development planning	Spatial construction planning	Land use planning	Environmental planning	Mine planning
National planning level				
MPI *Central socio-economic development plan* (5 years)	**MoC** *Master plan for a national system of urban centers* (10 years)	**MoNRE** *National land use master plan* (10 years) *National land use plan* (5 years)	**MoNRE** *National environmental protection strategy*	**MoIT** *Natural resource strategy* *Master plan coal industry*
Planning level Quang Ninh Province				
DPI *Quang Ninh socio-economic development plan* (5 years)	**DoC** *Quang Ninh regionaler master plan*	**DoNRE** *Quang Ninh land use master plan* (10 years) *Quang Ninh* land use plan (5 years)	**DoNRE** *Quang Ninh environmental plan*	(*Natural resource strategy*, planning statements regarding Quang Ninh Province; *Master plan coal industry*, statements regarding Quang Ninh Province)
Planning level Ha Long City				
DPI *Ha Long City socio-economic development plan*	**DoC** *Ha Long City general urban plan*	**DoNRE** *Ha Long City land use master plan* (10 years) *Ha Long City land use plan* (5 years)	(The *Quang Ninh environmental plan* applies)	(*Natural resource strategy*, planning statements regarding Ha Long City; *Master plan coal industry*, statements regarding Ha Long City)
Planning level planning area Hon Gai				
Ha Long City socio-economic development plan, planning statements regarding the planning area Hon Gai	*Ha Long City general urban plan*, planning statements regarding the planning area Hon Gai	*Ha Long City land use plan*, planning statements regarding the planning area Hon Gai	*Quang Ninh environmental plan*, planning statements regarding the „rehabilitation zone" and the „active environmental management zone"	*Master plan coal industry, Hon Gai partial plan* *Extraction, decommissioning and rehabilitation plans for mining companies*

Stakeholder in Quang Ninh



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Options for planning approach

Option 1

- Simple rehabilitation planning by mining companies, approval by MoNRE, implementation, return of land to local authorities (complying with legal minimum demands)

Option 2

- Rehabilitation planning by mining companies for the generation of economically exploitable facilities (tourism, recreational areas or similar), approval by MoNRE, implementation, extension of land use rights, further operation and opening for visitors (corresponding with regulation no. 19/2015/ND-CP)

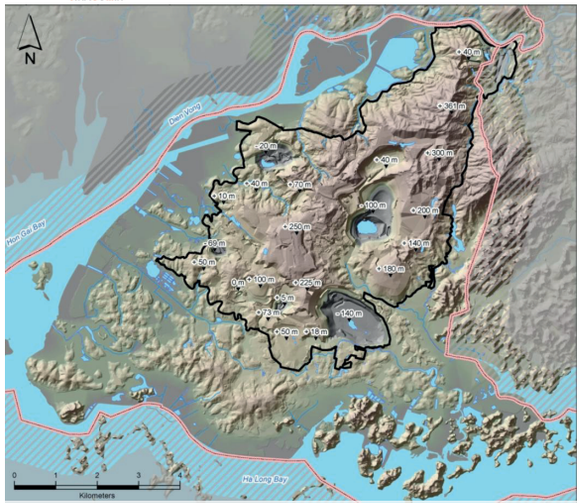
Option 3

- **Integration and coordination of post-mining land use planning into regional planning and urban planning in cooperation with the responsible authorities on municipal and provincial levels, approval by MoNRE, implementation with individual regulation of funding, land use rights, further use and economic usability.**

Stakeholder Communication

- Mediation between the planning cultures
- Enquiry of concrete interests and motivations of stakeholders
- Planning system using GIS, descriptive 2D and 3D visualisation (different time periods, planning conflicts etc.)
- Delimitation of spatial planning units
- One-on-one interviews and workshops with stakeholders
- Presentation of concrete solution approaches to get feedback
- Integration of existing plans
- Roadmap for mine closure and post-mining land use

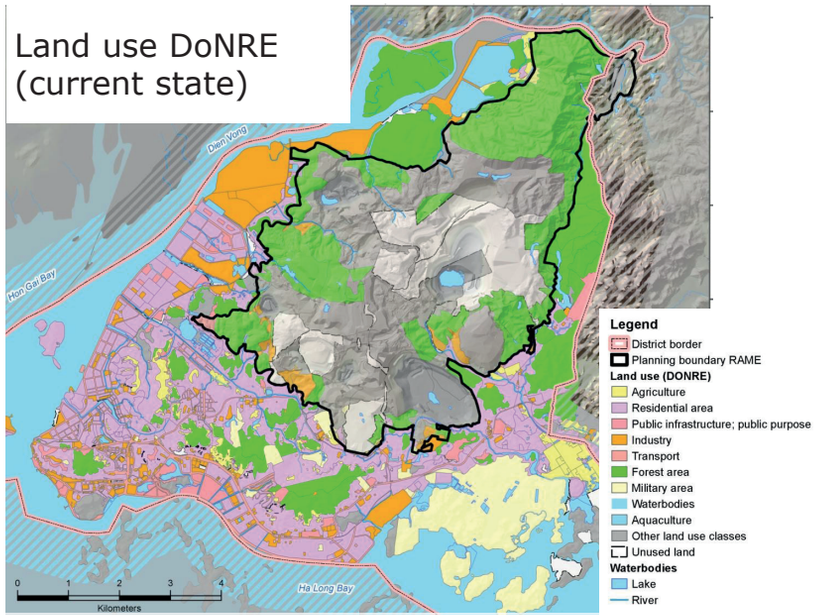
Investigation area Hon Gai Planning area



Delimitation of the planning area by using:

- Extraction boundaries
- Boundaries of rehabilitation plans
- Location of further mine infrastructure
- Exclusion of residential areas
- Inclusion of forest areas
- Zone boundary of the urban construction plan

Land use DoNRE (current state)



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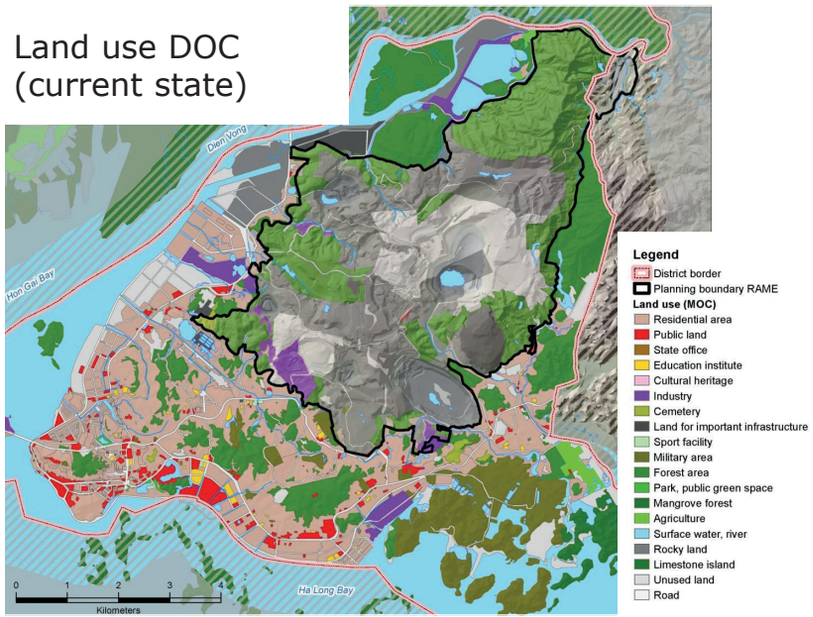
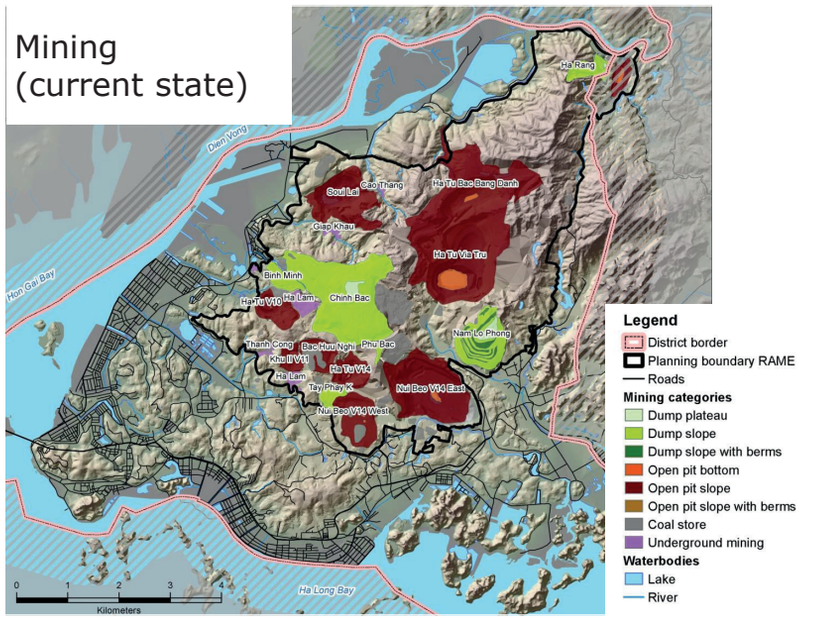
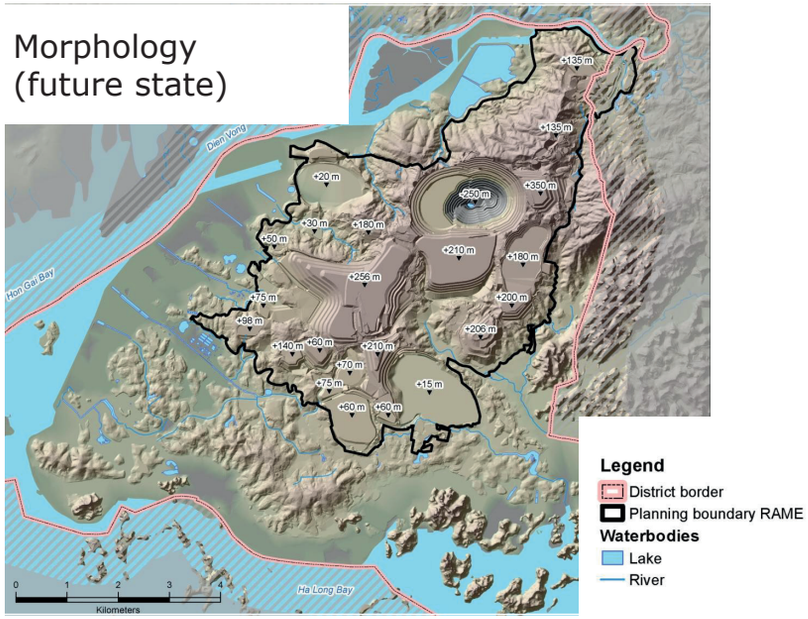
Land use DOC (current state)



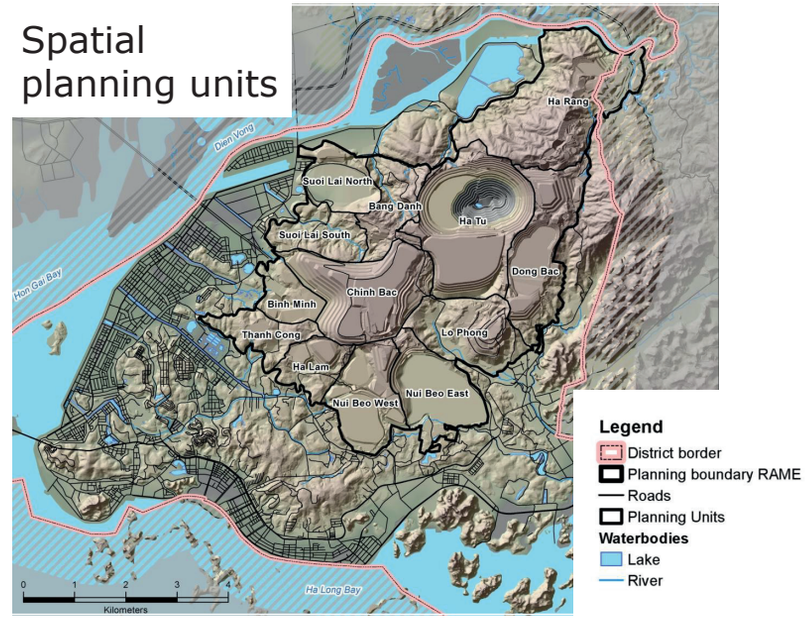
Mining (current state)



Morphology (future state)



Spatial planning units



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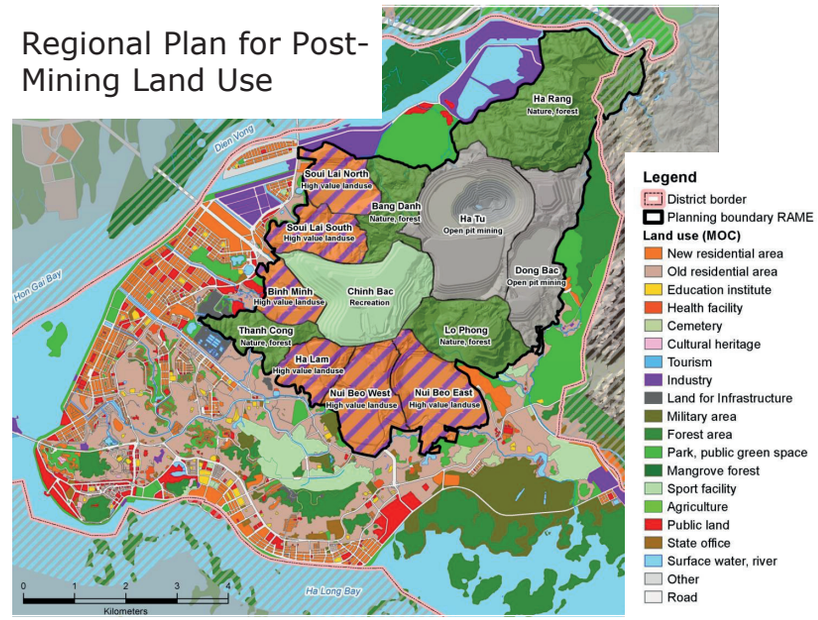
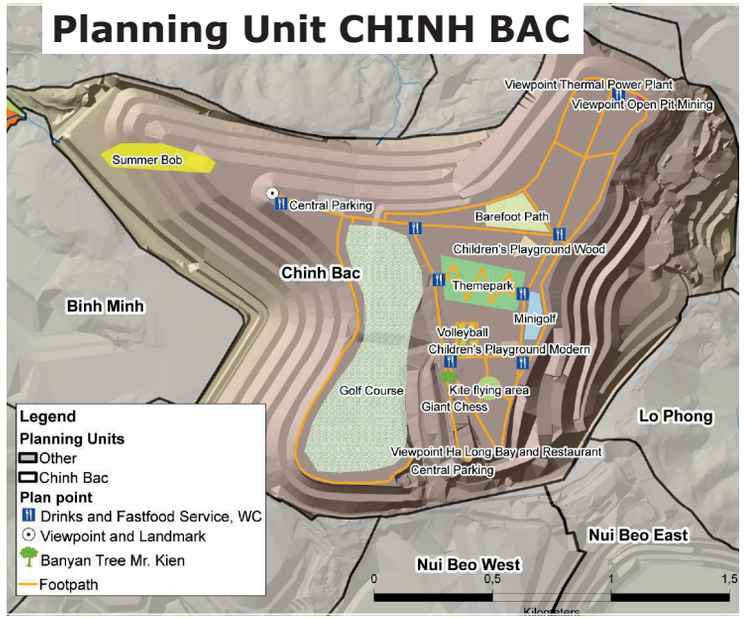
Criteria for post-mining land uses

- Higher value land uses such as residential or industrial areas should be established on flat terrain and near existing urban areas.
- Parks, recreational areas and forest should be established on uneven or hilly terrain.
- Large waste rock dumps should be reserved for special uses.
- Green corridors connect forest and recreational areas with each other.

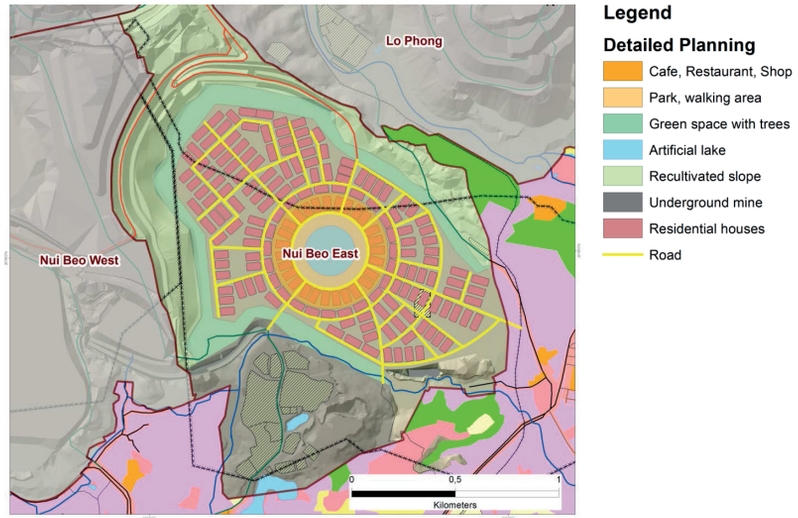
Regional Plan for Post-Mining Land Use



Planning Unit CHINH BAC



Planning Unit NUI BEO EAST



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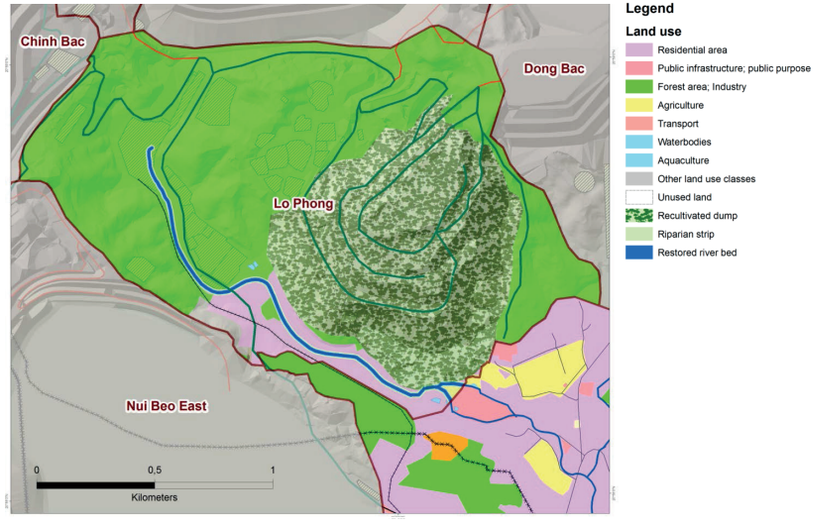
Planning Unit LO PHONG



3D Visualisation

3D Visualisation

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3D Visualisation

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3D Visualisation

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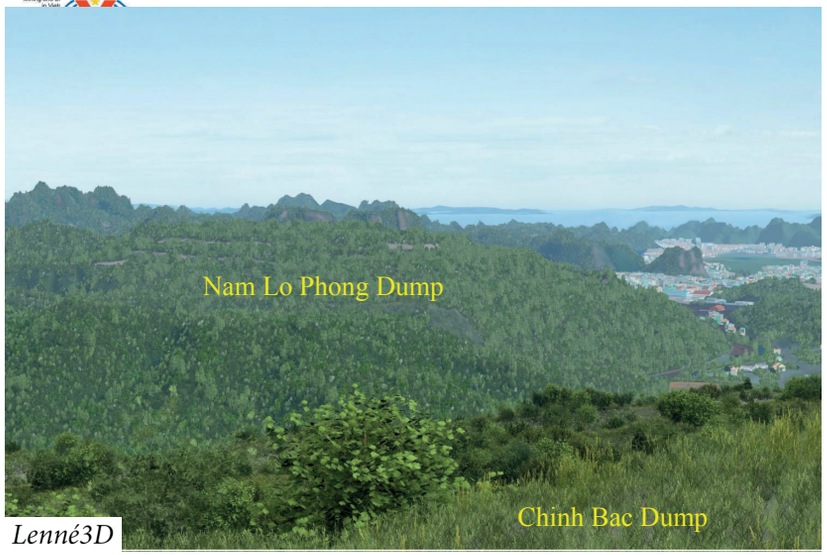

Planning conflicts, Examples

- Morphology, Landscape
  - Steep waste rock dump next to a deep open pit mine
  - Final shape of waste rock dumps
- Safety aspects
  - Erosion
  - Slope stability
  - Settlements, mine subsidence
- Overlapping plans
  - 7 different plans for the waste rock dump Chinh Bac
  - Land use in the border zone between residential and mining areas
  - Land use between different mines
  - New urban development area overlapping with an extension of an open pit mine

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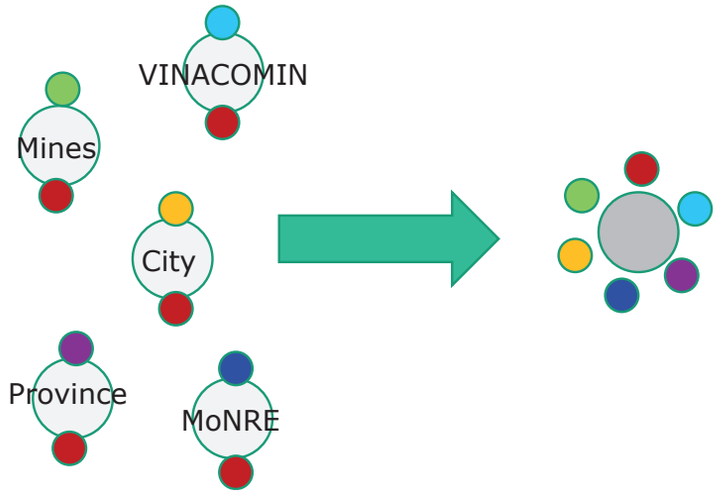
Planning conflicts, Solutions

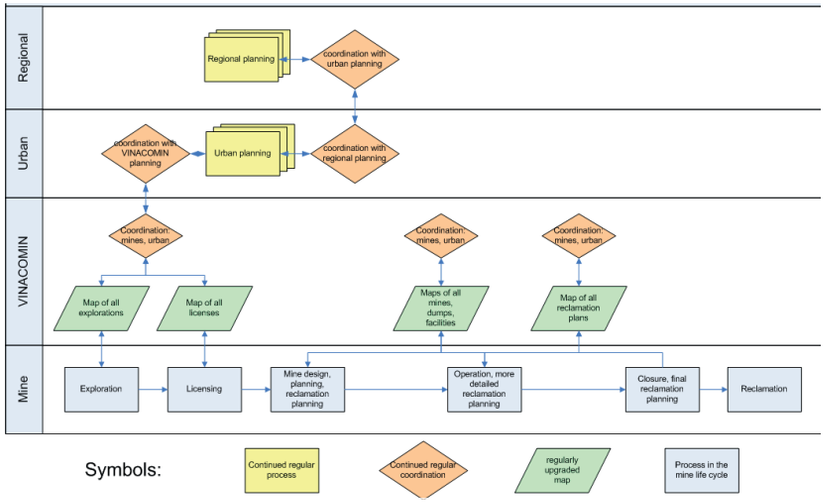
- ✓ Urban construction planning considers the current and the future state in the mining areas
- ✓ Environmental rehabilitation plans are developed in cooperation between the mining companies
- ✓ Environmental rehabilitation plans prepared by the mining companies consider regional and urban construction plans
- ✓ Integration of post-mining land use and urban development
- ✓ Information exchange between the most relevant stakeholders

- × Land register for a more exact determination of the border between urban land use and mining
- × Improved design of extraction and waste rock dumps in order to achieve adapted post-mining landscapes and higher safety
- × Integrated water management for mine and domestic waste waters

One-on-one interviews and workshops with stakeholders



General Roadmap: coordination between different levels



Concept for a Hon Gai Roadmap

- Set up a project team responsible for mine closure and post-mining activities
- Set up hardware, software; capacity building
- Review land use rights, update planning system
- Update other new information into the planning system
- Agreement on regional plan for post-mining land use incl. infrastructure with all stakeholders
- Implementation of the regional plan into mine and dump design, mine and dump operation
- Set up detailed mine life schedules for all mines, coordinate activities (exploration, extraction, dumping, closure, rehabilitation, post-mining phase)
- Detailed planning for planning units

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Conclusions and Outlook

- The presented approach allows an integrated post-mining land use planning with participation of the stakeholders and complying with the current legislation of Vietnam
- Important instruments for the stakeholder communication are GIS maps, 3D visualisation, one-on-one interviews and workshops with stakeholders, solution concepts and feedback, integration of existing plans, roadmap
- The framework conditions in Vietnam require a continuous planning process with many adaptations
- Improvements to tiered, more systematic and binding plans require fundamental changes in the Vietnamese planning legislation

Mining and Quarrying in Saxony

Saxony has significant deposits of gravel and sand, as well as rocks for the production of gravel and grit. The raw materials are used particularly in the construction and building materials industry, but also as a basic material in other branches of industry. The production takes place in more than 200 companies, which are under supervision of the mining administration.

The Saxon Oberbergamt (Upper Mining Authority), headquartered in Freiberg, is responsible for the control of mining activities in the Free State of Saxony on the basis of the German federal law and the law of the Free State. This includes the enforcement of the Federal Mining Act and the provisions adopted pursuant to this Act, as well as provisions outside the field of mining law – like water law – in all mining operations.

The raw material strategies of the Federal Government and the Free State of Saxony form the strategic framework for the sustainable development of the mining industry in Saxony and serve as an orientation to the Oberbergamt.

Prof. Dr. Bernhard Cramer

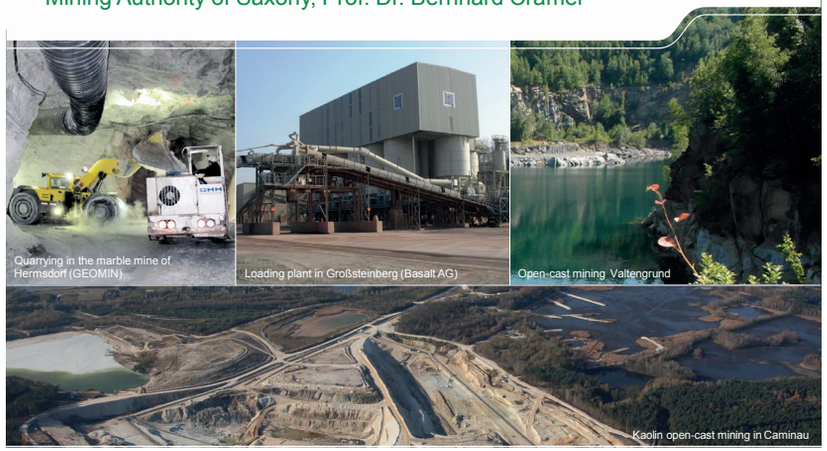
Saxon Mining Authority

(Oberbergamt)

SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

Mining and Quarrying in Saxony

Mining Authority of Saxony, Prof. Dr. Bernhard Cramer



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Mining Authority of Saxony

Specialized and Enforcement Authority, Governmental Supervision of Mining

- **Grant of mining licence**
  - Permission – approval – mining properties / property rights
- Imposing mining related **fees (Feldes- und Förderabgaben)**
- **Authorization of management plans** (scouting plans, master plans, main operational plans)
- Monitoring of **occupational safety**
- **Termination** of **mining supervision**
- **Environmental, health and safety protection** at the workplace
- **Financing** of **post-mining measures**
- **Hazard prevention** in regard to underground cavities, landfills and pits of mining (police authority), consultating other authorities, management of underground cavity maps

2 | 22. Juni 2016 | B. Cramer

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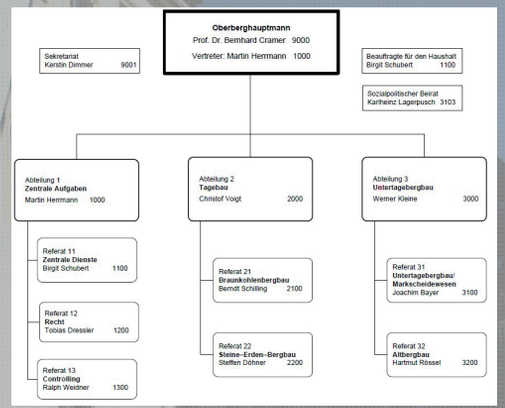
Mining Authority of Saxony

Specialized and Enforcement Authority, Governmental Supervision of Mining

Mining Authority of Saxony

- **Approx. 80 employees**
- **Budget: approx. 75 Mio. €**



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Federal Mining Act

The federal mining act determines

- **Securing supply of raw materials** and **provision of specific hazards** (§ 1) based on a **tiered licensing procedure**
- Access to raw materials
- Operational plans and mining supervision: solution of conflicts regarding environmental protection, fire and health protection as well as occupational safety of employees and others
- Pre-eminence of mining companies with respect to landed property "7 Grundabtretung (compensation payment)
- Compensation of mining damages
- Rehabilitation of surfaces

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

Spatial Planning

The planning regulations of the federal German states determine at the same time

- How conflicts in landuse between future mining projects and other potential usage categories of certain areas can be solved by local administrations "7regional plan/ brown coal plan
- Requirements for rehabilitation and subsequent usages "7 redevelopment framework
- These legal requirements of spatial planning are mandatory for approvals in accordance with mining law

SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

Federal Mining Act

Tiered licencing procedure 1: access to raw mineral materials

- **Permission**"7Recht zur ausschließlichen Aufsuchung
- **Authorization**"7exclusive extraction (+planning)
- **Mine property** (unattached to landed poperty grundstücksgleiche Beleihungsfähigkeit)
- **Grundabtretung** (gegen Entschädigung)

Permissions / authorizations are granted:

- For high-efficient companies
- If projects are operated without time delay
- If no reasons against the general welfare are opposed

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

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Federal Mining Act

Tiered licencing procedure 1: access to raw mineral materials

EU-directive 94/22/EC on the conditions for granting and using authorizations for the prospection, exploration and quarrying allows the choise between two systems:

- **Tendering** by public announcement (more suitable, if more companies are intressted than qauthorizations can be assinged)
- **Open-Door-System**, permit applications can be made at any time e.g. in Germany and Austria

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

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Federal Mining Act

Tiered licencing procedure 2: Solution of environmental conflicts

- In proceeded within the scope of a **general operating plan** for the whole project ,
- Profided that a significant degregation of the environment can be estimated.
- The authorizing authority have to consult other (public) authorities, official experts and affected third parties
- The procedure is open to the public and everybody can participate.

The general operating plan is granted, if

- Avoidable damages were avoided,
- Inevitable damages were compensated
- The latest approved and well-established technical regulations were used

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

Federal Mining Act

Tiered licencing procedure 2: Solution of environmental conflicts

- The degradation of water bodies is prohibited . Limited exceptions just in case of public interests (raw materials supply)
- The interference with nature an landscape have to be compensated, upvaluation of other landscapes.
- Mining waste can be used to restock cavities, for other waste the ordinary waste regualtions are obligatiry
- The soil has to be protectet from contaminations, the upper layers (3m) have to be permeable for roots
- For durst, noise and vibrations caused by detonations daytimedependent limits are compliant
- Legal requirements for environmental impact assessments

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

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Federal Mining Act

Tiered licencing procedure 3: Occupational -, health and fire protection, public safety

- Occuring within the scope of main operating plan for each 2 years (and comprehensive special operating plans, e.g. industrial railway, regarding detonations, etc.)
- National common technical rules and standards
- Regional regulations for special geotechnical requirements.

The general operating plan is granted, if

- All applicable regulations (general operating plan, common rules and standards of health, occupational and fire protection) are complied,
- (Environmental) laws were not changed enforceable.
- Often communites and citizens initiatives enforce concessions by negociations

BBergG vom 13. August 1980 (BGBl. I S. 1310), das durch Artikel 4 Absatz 71 des Gesetzes vom 7. August 2013 (BGBl. I S. 3154) geändert worden ist.

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SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

Mining activities in Saxony

Quarrying
- Stones and soil
- Brown coal
- Ore and xxx

Remediation mining and historic mine remains
- Brown coal
- Bismuth
- Hazard prevention
- Preventive measures

Mining Processes

1999 to 2014

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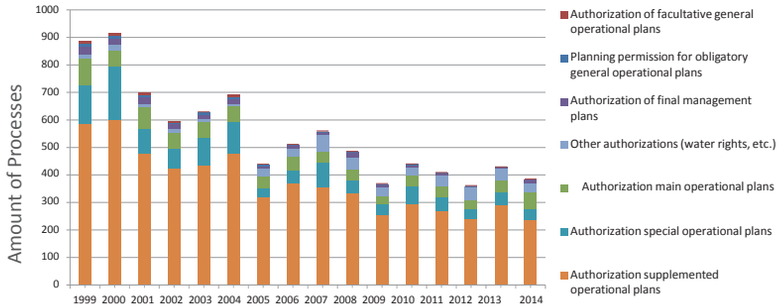

12 | 22. Juni 2016 | B. Cramer

Mining Authority

On-site-inspections 2005 to 2014

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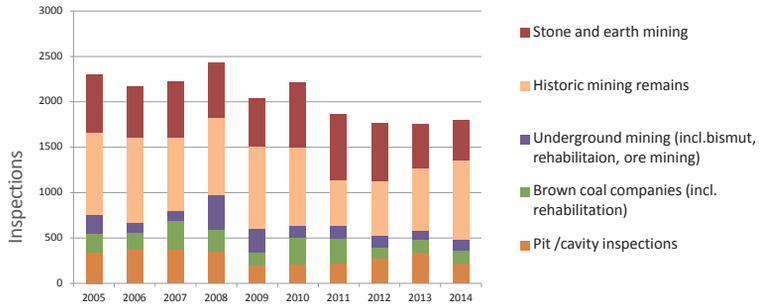

Mining Authority

… from the air

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Mining Authority

… from the air

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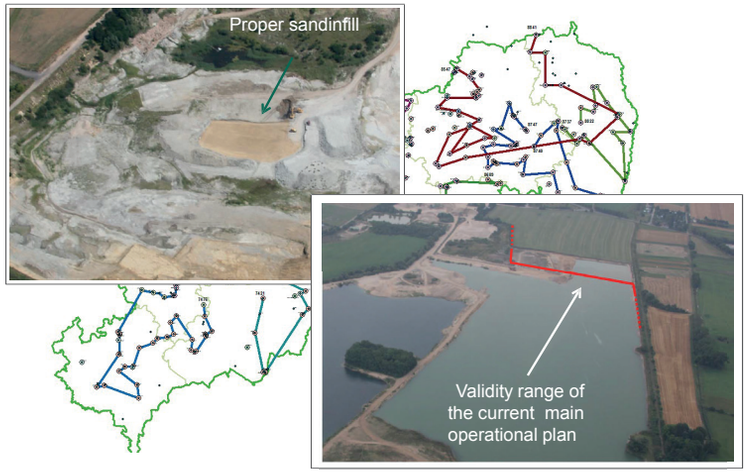

Valuable soils in Saxony

Mineral deposits (LfULG)

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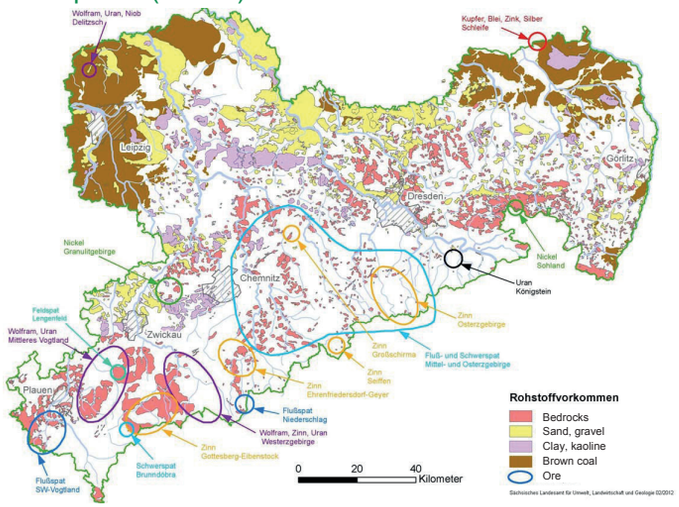

Mineral Ressources

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Mining Law

Bergfreie Bodenschätze
§ 3 Abs. 3 BBergG

- not in possession of the landowner
- mining permit required
- e.g. ore, coal, mineral oil

Bestandsschutz nach Einigungsvertrag

Grundeigene Bodenschätze
§ 3 Abs. 4 BBergG

- Property of the landowner
- no mining permit
- operational plan is mandatory
- e.g.: quartz sand, kaolin, basalt

Gravel, Sand, Lime, Bedrock

Grundeigentümerbodenschätze
Abgrabungsrecht

- Property of the landowner
- raw mineral materials not incoporated in BBergG
- Authorization granded by construction law or Emission Control Act, optionally: water / conservation law
- e.g.: gravel, granite, sand

Stone and earth companies

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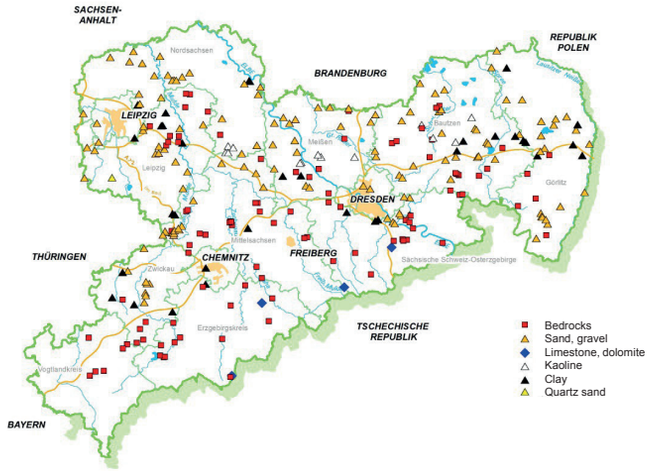
Under mining control authority, active quarrying in 2015



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Companies under Mining Control Authority

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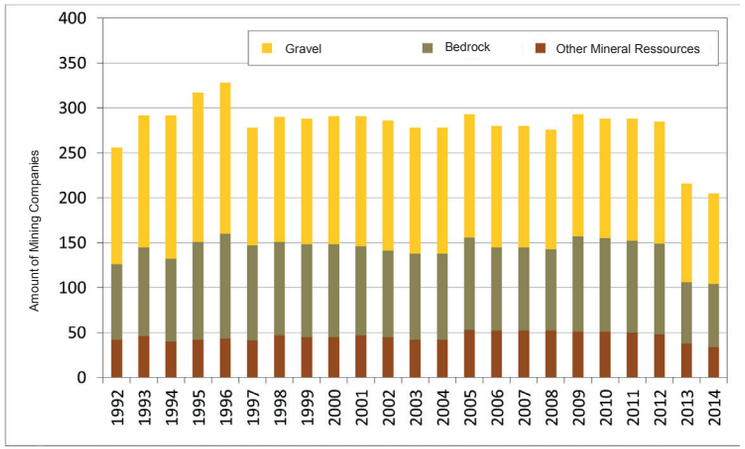
1992 to 2014



Stones and Earth

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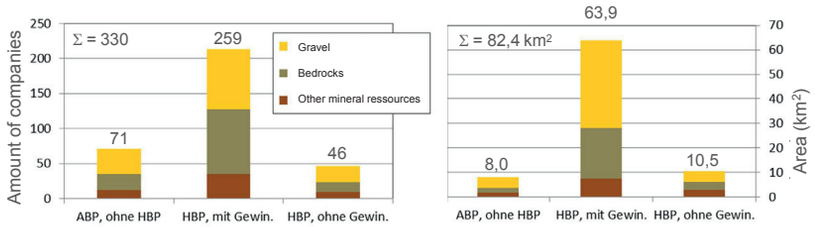
Operational plan areas



- 330 stone and earth companies unter mining control authority
- **Area in total 82,4 km²**
  - 22,3 km² Nassgewinnung (34 Betriebe)
- **0,45 %** of **the area of the Free State of Saxony** (0,12 % Nassgewinnung)

(Stand April 2016)

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Mining and Quarrying

Companies under mining control authority 2014

Type of Mineral Resource	Mining and Quarrying in 2014 (mtpa)	Amount of Mining Companies in 2014
Bedrock	19,76	70
Gravel, sand	14,11	101
Kaolin	1,60	11
Silt, brick clay	1,03	12
Lime and dolomite	0,54	3
Quartz- and modeling sand	0,044	1
Special clay	0,32	8
Total	**37,40**	**206**

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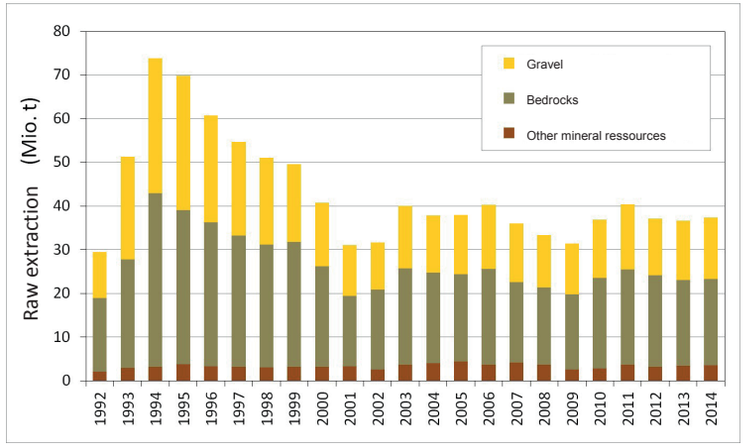
Mining and Quarrying

1992 to 2014



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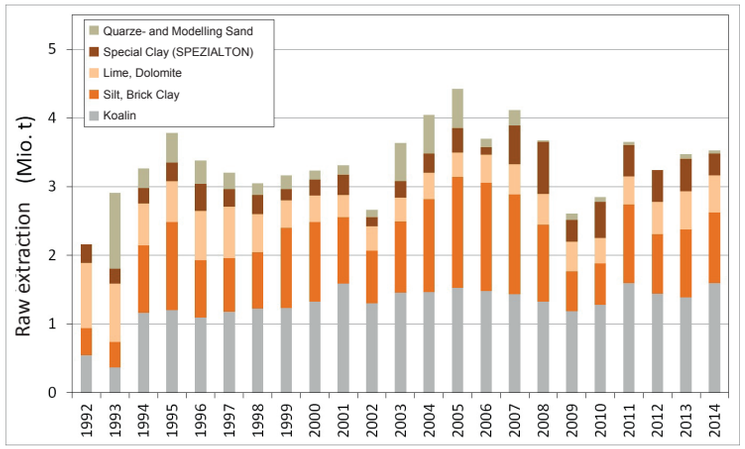
Mining and Quarrying „other mineral ressources“

1992 to 2014



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Results

Mining and Quarrying in Saxony

- Saxony is rich in depositis in a wide range of high-quality raw mineral materials.
- Stone and earth mining is an important and productive sector of economic activity in Saxony.
- Bau- und Industrierohstoffe were extracted by high-quality environmental standards in approx. 210 mines (under mining authority control) and provided for the processing industry (30 to 40 mtpa).
- The Stone and earth mining (km^2 open-cast mining) currently covers an area of 82,4 km2.

Results

Mining and Quarrying in Saxony

SÄCHSISCHES OBERBERGAMT | Freistaat SACHSEN

- **Current challenges** in mining also lead to an increasing economical burden
  - Since 1990 tightening of environmental laws
  - Strengthening of possibilities to participate for landowners, the general sociey and associations – proceedings are overstrained in regard of their duration
  - New mining projects are more difficult to realize without an advanced purchase of land („Garzweiler Urteil“ BVerfG,17.12.2013)
  - Harmonization of laws for mineral resources
  - Intensification of requirements to utilize mineral non-mining waste in open-cast mining under authority control - chance for nature conservation?

25 | 22. Juni 2016 | B. Cramer

www.oba.sachsen.de

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3	4

Tasks and Options in the Integration of Environmental Organizations in Germany as Part of Administrative Authorization Processes and Monitoring, Using the Example of Mining and Quarrying

Environmental associations in Germany are non-governmental, non-profit organisations. In general, they act as “lawyers for the environment” in legal authorization processes. In this regard they actively engage in public discourse on the topics of the environment and sustainability. The legal process of public participation encompasses a range of objectives: information, transparency and control, as well as efficiency of administrative processes. Furthermore, it creates public acceptance while ensuring legal protection and democratic participation.

Regarding the field of mining and quarrying, environmental organizations fulfil various tasks. Independent of particular authorization processes, they try to inform the public about sustainability strategies, for instance through public meetings, by disbursing scientific pamphlets and through campaigns. Moreover, organisations advertise more environmentally-friendly production processes and call for lower consumption of mineral resources. Especially in the fields of demand planning and regional planning for mining and quarrying, environmental organizations function as stakeholders, standing up for sustainability and a sensible use of natural resources.

A further task is to monitor administrative authorization processes regarding the environmental effects of specific projects and their relation to the public outcome of these projects.

Justus Wulff

BUND (Friends of the Earth Germany)

Regional Association Saxony

„Tasks and Options in the Integration of Environmental Organizations in Germany as Part of Administrative Authorization Processes and Monitoring, Using the Example of Mining and Quarrying “

Justus Wulff, Advisor for Legal Recommendations for public planning and decisions at the BUND (NGO), department Saxony

Bund für Umwelt und Naturschutz Deutschland
BUND
FRIENDS OF THE EARTH GERMANY

Structure of Presentation

I. Principles of public participation
II. Aims and function of public participation
III. Tasks and options of environmental organizations in the field of mineral mining
   a) Environmental education and upstream protection of natural ressources
   b) Demand planning and regional planning
   c) Administrative authorization processes

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3	4

I. Principles of public participation

- 3 principles/pillars of public participation established by the Arhus Convention (UNECE-Convention, 1998)

1. Pillar	2. Pillar	3. Pillar
• Access to environmental information (Art. 4 AK)	• Public participation in decision making (Art. 6 – 8 AK)	• Access to justice/court (Art. 9 AK)

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II. Aims and Function of Public Participation

1. Information
2. Transparency and control
3. Efficiency of administrative processes
4. Public acceptance
5. Preventive legal protection
6. Democratic participation

(compare also: Zschiesche, M., Öffentlichkeitsbeteiligung in umweltrelevanten Zulassungsverfahren [Participation of the Public in approval procedures related to the environment], 2015, S. 57 ff.)

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III. Tasks and Options of Environmental Organizations in the Field of Mineral Mining

a) Environmental education and upstream protection of natural ressources

- The aim is to create an environmental awarness within the society to reduce the supply and demand on minerals
- Integration of sufficiency strategies
- Strengthening of the recycling management and cleaner production of minerals

http://www.klimacamp-im-rheinland.de/

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III. Tasks and Options of Environmental Organizations in the Field of Mineral Mining

b) Demand- and regional planning

- Review of the demand forecast of minerals (sustainability)
- Review of the regional planning and arrangement of mineral mines regarding land use conflicts (balance between environmental and economic interests)
- Introduce information in the planning process to make the regional planning more effective
- Participation of the public and social institutions in the process of regional planning

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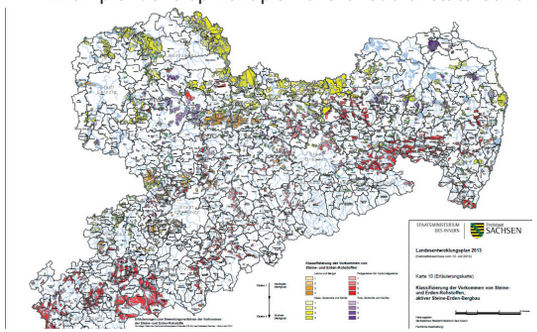
III. Tasks and Options of Environmental Organizations in the Field of Mineral Mining

b) Regional planning of mineral mines

- Example: development plan of the federal state Saxony, 2013



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III. Tasks and Options of Environmental Organizations in the Field of Mineral Mining

c) Administrative authorization processes

- Review of environmental impact assessment of specific mining projects
- Compliance of legal regulations on mining
- Review of the suitability of the mining location and of the intended ecological compensation
- Participation regarding questions of subsequent use of mineral mines

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III. Tasks and Options of Environmental Organizations in the Field of Mineral Mining

Source: Google-Maps, Bund.net

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Thank you for your attention!

Bund für Umwelt und Naturschutz Deutschland
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REPORT OF THE FIELD TRIPS


349E
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ZEPPELIN

Extraction of Aggregates

Wednesday, 29.6.2016

Ostrauer Kalkwerke GmbH, Ostrau and
BWH Basaltwerk Mittelherwigsdorf OHG, Mittelherwigsdorf

Tour Organizer: Consulting und Engineering (C&E) GmbH

1. Ostrauer Kalkwerke GmbH Ostrau

- Deposits: Dolomite – limestone
- Reserves: for about 100 years (at current output)
- Annual output: approx. 300 Tm^3
- Mining method: underhand stoping
- Burden ratio: 2:1 (2 m^3 overburden to 1 m^3 rock)
- Exploitation: Drilling and blasting (drilling scheme to be submitted later)
- Charging method: LHD-Method and dump truck until treatment
- Extraction: approx. 90 %
- Main product: fertiliser / filling material / road construction material
- Cutting direction: South Southeast (Expansion area)
- Mining direction: parallel benching, congruent with cutting direction

Figure 1: Full view of the limestone plant of Ostrau – aerial photograph

(Photo: Ostrauer Kalkwerke GmbH, http://www.ostrauer-kalkwerke.de/index.php?id=17)

The extraction is realised by benching of the respective slice, height of slice approx. 20 to 22 m. The height of the slice correlates to the present thickness of the in-situ dolomite package.

The overburden is used for refilling (overlying rock, clay – loess clay).

Number of personnel during the production process: 15 to 16 (estimated)

Figure 2: Wall face, preparation for extraction (Photo: Riedel/C&E)

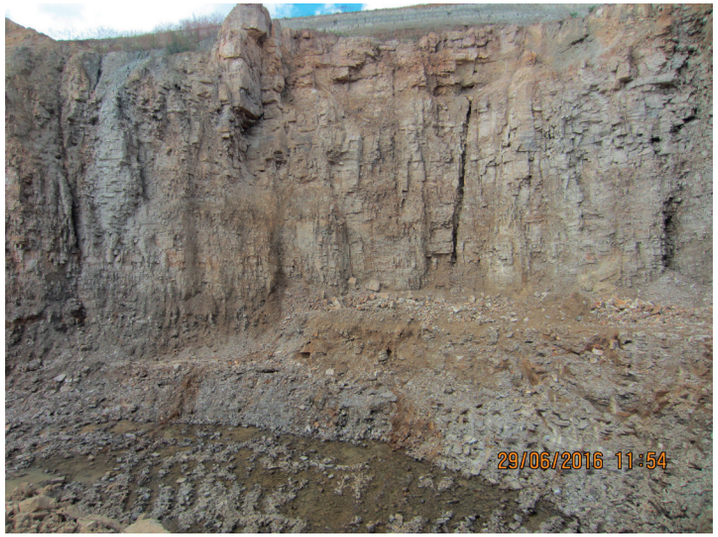


Figure 3: Solid mining thickness (Photo: Riedel/C&E)

2. BHW Basaltwerk Mittelherwigsdorf/Lausitz

- Deposits: basaltic rock
- Reserves: for about 15 years
- Annual output: approx. 300 Tm^3 / approx. 500 Tm^3 depending on demand
- Mining method: underhand stoping over berm, downwards
- Exploitation: drilling and blasting, annual approach approx. 3 months
- Charging method: excavator and dump truck until treatment / partial conveying
- Extraction: n/a
- Main product: crushed rock, grit, aggregates
- Cutting direction: not defined
- Mining direction: parallel to the cut berms (90 degree offset to cutting direction), downwards

Figure 4: Full view – aerial photograph (Photo: Deutsche Fotothek; http://www.deutschefotothek.de/documents/obj/71228701/elb_euroluftbild_0022363).

The extraction is realised by benching from berms. The height of the berms is about 10 to 15 m. The process is executed in one quarter for drilling and blasting works, subsequently charging, transportation, processing.

The drilling is executed by external contractors; the blasting work is realised by the company itself.

Borehole matrix: 4 x 5 m (to be submitted later)

Explosive consumption: 0.5 kg /m3

The blasting pattern is optimised so that during the following operations no further drilling or blasting is necessary (the obtained grain size correlates with the existing processing conditions in the broadest sense).

Figure 5: Preparation of mining block for extraction (Photo: Riedel/C&E)


Base map: Leaflet © OpenStreetMap; IOER 2016
Brandenburg
Sachsen
DE
PL
CZ
Wednesday 29.06.2016
Ostrauer Kalkwerke GmbH
IÖR
Weberplatz 1
Dresden
Wednesday 29.06.2016
BWH Basaltwerk Mittelherwigsdorf GmbH & Co. KG
Dommitzsch
Torgau
Falkenberg/Elster
Finsterwalde
Drebkau
Großräschen
Spremberg
Bad Muskau
Bad Liebenwerda
Senftenberg
Belgern
Elsterwerda
Ruhland
Lauta
Hoyerswerda
Dahlener Heide
Gröditz
Ortrand
Wittichenau
Dahlen
Strehla
Oschatz
Niesky
Kamenz
Mügeln
Elstra
Weißenberg
Leisnig
Meißen
Bischofswerda
Radeberg
Hartha
Löbau
Dresden
Mittweida
Großschirma
Tharandt
Pirna
Frankenberg/Sa.
SAXONY
(SACHSEN)
Dippoldiswalde
Oederan
Chemnitz
Frauenstein
Děčín
Česká Kamenice

Recultivation and Post-Mining Development

Thursday, 30.6.2016

Region of Lausitz/Lusatia

Tour Organizer: IOER

Local tour operator: Karsten Feucht (transform – Tourism Concepts and Project Management)

First stop: Presentation by the tour operator Karsten Feucht

Place: IBA-Studierhaus Lausitzer Seenland e.V. in Großräschen

The region of Lausitz/Lusatia

Lusatia (German: Lausitz) is an historical region in eastern Germany. Stretching from the Polish border in the east to the Elbe valley in the west, today it is located within the German states of Saxony and Brandenburg. Lusatia comprises two scenically and historically different parts: a hilly southern "upper" region and a "lower" region. The latter was the goal of the study tour.

The International Building Exhibition (IBA) Fürst Pückler Land 2000 to 2010

International building exhibitions have been the engines of urban development in Germany for more than one hundred years. Traditionally, the focus has been on domestic architecture. The IBA Emscher Park, which ran from 1989 to 1999, was the first building exhibition dedicated to the restructuring of an entire region, specifically the Ruhr industrial area in western Germany. It helped to develop a new type of post-mining cultural landscape. A similar approach was adopted by the IBA Fürst Pückler Land from 2000 to 2010 in the south of Brandenburg.

Brown coal and post-mining transformation

Currently, millions of cubic meters of soil are being moved in Lusatia within the framework of brown coal extraction and redevelopment. In this onetime energy heartland of the GDR, we now find Europe's largest landscape construction site, where mountains are being moved and new lakes created. Included in this process of change are industrial buildings, mining equipment, company towns and large-area industrial sites for which new and alternative uses must be found. But the main attraction is the new Lusatian Lake District – a group of artificial lakes connected by navigable canals.

Local tour operator Karsten Feucht during his introduction

Construction area “New Harbor” in Großräschen

Second stop: The IBA Terraces in Großräschen and the new harbor

Until 1999 Großräschen was a mining town. Shortly before reunification in 1989/90, around 4,000 of the town’s inhabitants were relocated, many to the new construction development Großräschen-Nord. Today, very few of south Großräschen’s buildings remain to tell of the town’s mining history. In the recent past, the entire town – including its decayed historic town center – had become bleak and dreary. Yet now Großräschen is on the way to becoming a lakeside town. The former open cast mine is being filled with water and several tourism projects have been completed or are underway, e.g. the IBA terraces, the new harbor and the pier.

Opened in 2004, the IBA Terraces in Großräschen were awarded the Architectural Prize of the Federal State of Brandenburg. They have received much attention both in specialist circles and amongst the general public. All the major architecture journals reported on this radical structure on the edge of an open cast mine. (source: http://www.iba-see2010.de/en/projekte/projekt1.html)
(source: http://www.iba-see2010.de/en/projekte/projekt1.html)

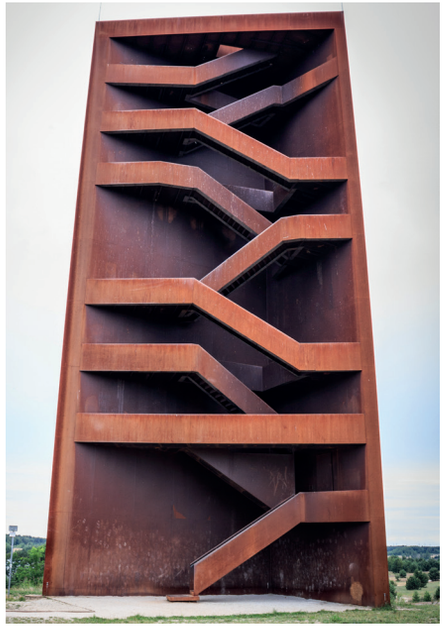
Open-cast mine “Welzow-Süd” including conveyor bridge

Third stop: Open cast pit operations in Welzow

The Welzow-Süd open cast pit lies between Spremberg and Welzow, where huge conveyor bridges and bulldozers have raked up the soil, leaving behind a bizarre moonscape of monotonous sandy desert with the same recurring patterns. Work began in and around the Welzow-Süd open cast mine in 1959. At that time there were about thirty working open cast mines in the Lusatia area. All but four of these were shut down after 1990. Welzow-Süd is one of the last remaining mines. It will continue to produce brown coal until at least 2030 and perhaps until 2050. While the coal seam here is particularly abundant, it lies at a considerable depth of about 80 to 100 meters below the surface (source: http://www.iba-see2010.de/en/projekte/projekt8.html).

Fourth 4: The landmark „Rusty Nail“

In order to give a clear perspective on the changing landscape, a viewing tower was erected and opened in 2008 on the Sorno canal between Lake Sedlitz and Lake Geierswalde in the heart of the new lake district. Constructed from rust-colored Corten steel, the Landmark intentionally echoes the industrial origins and history of the area, providing a visual reminder of steel mining equipment while the sculptural staircase symbolizes human achievement and looks to the future. From a height of thirty meters, visitors can see three lakes and the three power plants Schwarze Pumpe, Boxberg and Jänschwalde on the horizon. Since its opening, the Landmark has attracted much interest and numerous visitors both from specialist circles and the general public. It has been nicknamed the “Rusty Nail” (source: http://www.iba-see2010.de/en/projekte/projekt10.html).



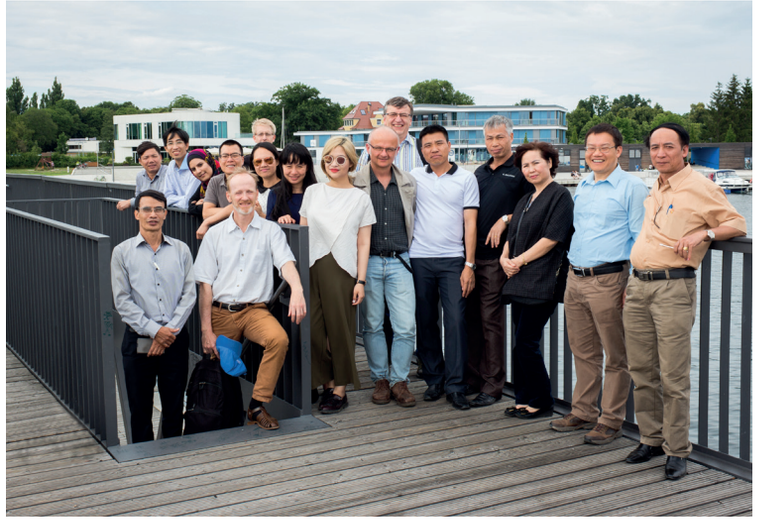
Landmark “Rusty Nail” in the Lusatian Lake District

Fifth Stop: The Lusation Lake District including artificial watercourse connections

The Lausitz and Central-German Mining Administration Company (LMBV), owned by the Federal Republic of Germany, was established in 1994. Its focus of activities is the rehabilitation and recovery, and increasingly also the reclamation, of areas claimed for lignite mining. In this way the foundation was laid for the comprehensive restructuring and recovery of former mining regions in eastern Germany. The LMBV’s original area of responsibility covered approximately 107,000 hectares of mining land (source: LMBV 2009; “The company – we change regions”).

The most prominent LMBV recultivation project is the upgrading of watercourse connections between the emerging lakes in the Lusatian and Central German Lake Districts to form navigable canals. The objective here is to create linking waterways which are attractive to tourists and not simply commercial in nature. Of the thirteen canals planned for the Lusatian Lake District, most have already been completed (source: LMBV 2014; Views).

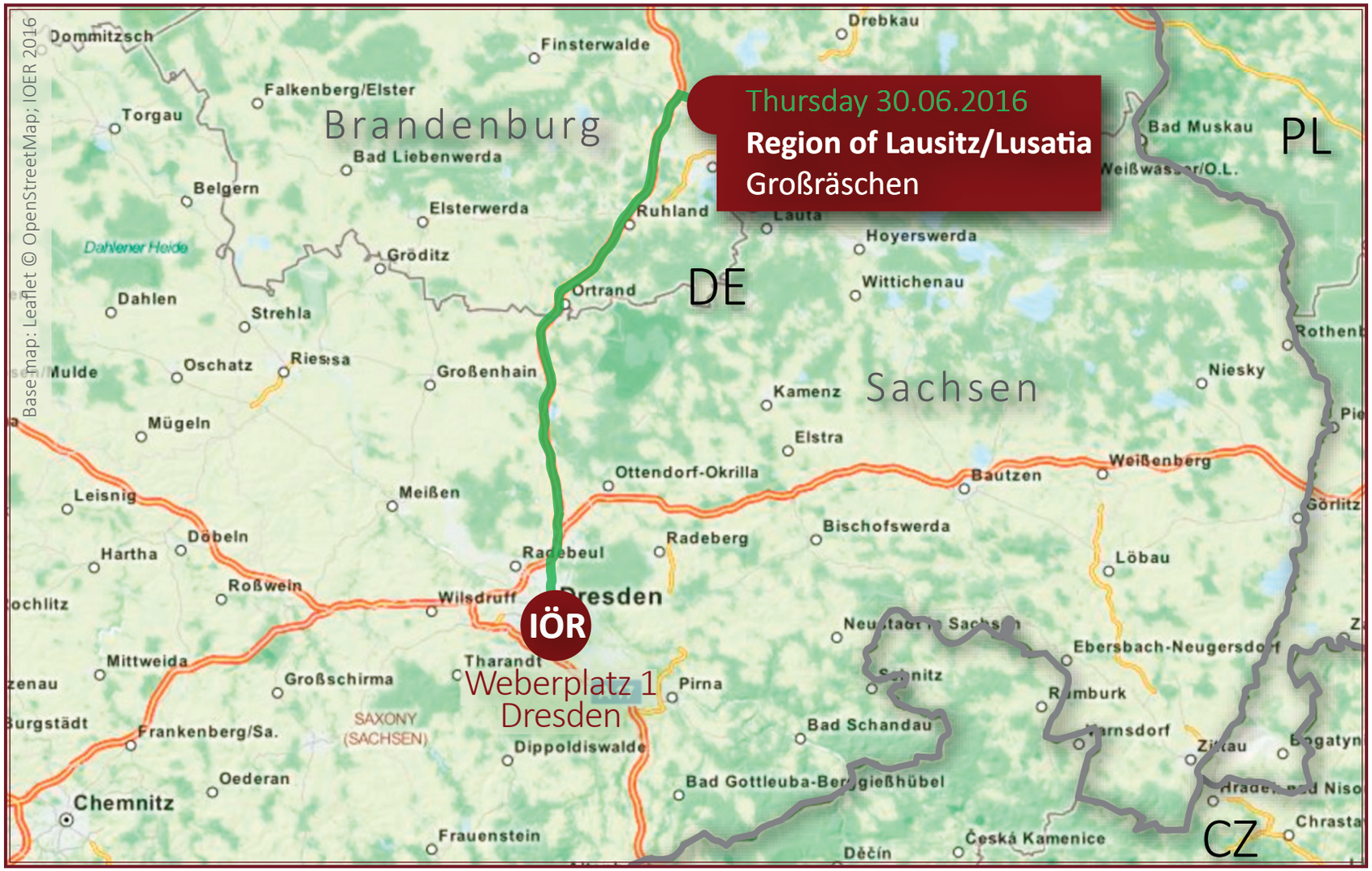
The Sorno Canal is connecting Lake Sedlitz and Lake Geierswalde



The excursion group in the new Senftenberg harbor

Sixth stop: Senftenberg Lake including the new harbor of Senftenberg City

In the wake of the decision to connect Lake Senftenberg and Lake Geierswalde as well as most of the new lakes by canals, the idea arose that the city of Senftenberg should have its own harbor in order to prepare the town for its new role as a centre for water sports and to connect it with the lake both architecturally and in terms of urban planning. Based on the original development plan, the IBA and the city ran an architectural competition in 2009 to design a new city harbor. The prize-winning design envisioned a bowl-shaped quay and a delicate bridge on the lake. The project was realized from 2011 to 2013 and has quickly become a new attraction for Senftenberg (source: http://www.iba-see2010.de/en/projekte/projekt12.html).


Thursday 30.06.2016
Region of Lausitz/Lusatia
Großräschen
Base map: Leaflet © OpenStreetMap; IOER 2016
Brandenburg
DE
Sachsen
PL
CZ
IÖR
Weberplatz 1
Dresden
Dresden
Chemnitz
Dommitzsch
Torgau
Falkenberg/Elster
Finsterwalde
Drebkau
Bad Liebenwerda
Belgern
Elsterwerda
Ruhland
Lauta
Hoyerswerda
Bad Muskau
Weißwasser/O.L.
Dahlener Heide
Gröditz
Ortrand
Wittichenau
Dahlen
Strehla
Mulde
Oschatz
Riesa
Großenhain
Kamenz
Niesky
Mügeln
Elstra
Ottendorf-Okrilla
Bautzen
Weißenberg
Leisnig
Meißen
Görlitz
Döbeln
Radeberg
Bischofswerda
Hartha
Radebeul
Löbau
Roßwein
Wilsdruff
Mittweida
Tharandt
Ebersbach-Neugersdorf
Großschirma
Pirna
Burgstädt
Frankenberg/Sa.
SAXONY
(SACHSEN)
Bad Schandau
Dippoldiswalde
Oederan
Bad Gottleuba-Berggießhübel
Frauenstein
Děčín
Česká Kamenice