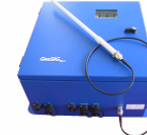
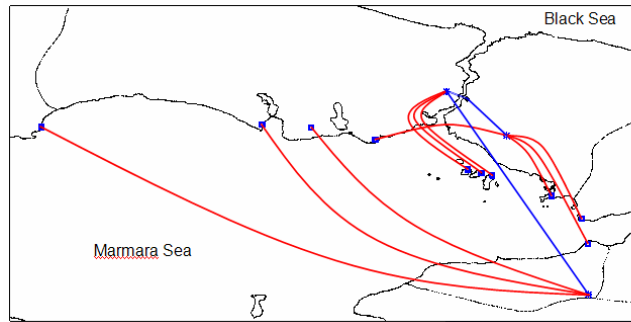


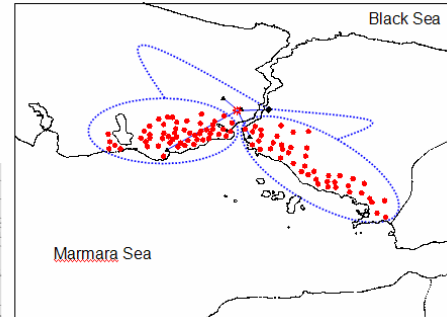
GeoSIG

Selected Projects

Istanbul Metropolitan Earthquake Early Warning and Rapid Response System



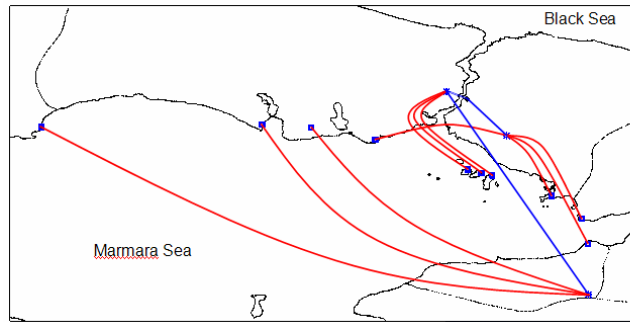
Axes	456
Sensors	152
Digitisers / Recorders	12 Online 100 Dial Up 40 Offline
Communication	<ul style="list-style-type: none"> • Spread Spectrum • GSM • Cable
System Center	1 main 1 secondary 4 auxiliary
Project Value (1'000 US\$)	2'000
Duration (weeks)	52
Completion Year	2002
Country	Turkey



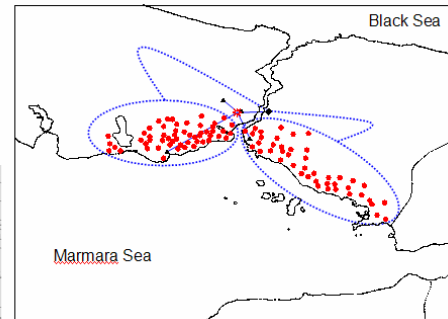
Scope

- A cultural capital with more than 12 Million people and more than 20% of the GDP of the country
- A probability of 62% of occurrence of a magnitude 7.5 earthquake in the next 30 years
- Early Warning for safe shutdown of lifelines and important industrial facilities (5 to 10 seconds before seismic waves)
- Rapid Response for seismic disaster management and relief
- Structural Monitoring for historical and vital structures
- Substantial contribution to the scientific arena for:
 - a better understanding of the seismic hazard on the less-known western portion of the North Anatolian Fault
 - comprehensive risk mitigation studies and disaster scenarios depending on regional real earthquake data

Istanbul Metropolitan Earthquake Early Warning and Rapid Response System



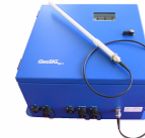
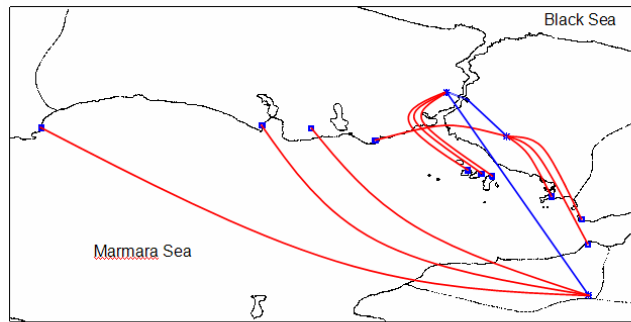
Axes	456
Sensors	152
Digitisers / Recorders	12 Online 100 Dial Up 40 Offline
Communication	<ul style="list-style-type: none"> • Spread Spectrum • GSM • Cable
System Center	1 main 1 secondary 4 auxiliary
Project Value (1'000 US\$)	2'000
Duration (weeks)	52
Completion Year	2002
Country	Turkey



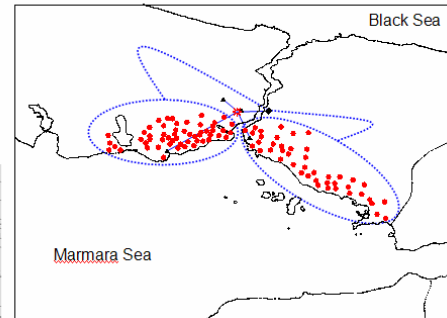
System

- Revolutionary GSS Multichannel Data Acquisition instruments for 12 on-line, 100 dial-up and 40 off-line stations
- 3 spread spectrum repeaters utilised to overcome telemetry distances more than 100 km and topography
- 4 auxiliary centers are installed as reporting centers for the disaster managers
- System reports and alarms designed to be transmitted via GSM, SMS, Spread Spectrum and Internet
- 2 redundant data acquisition and processing centers, completely designed and furnished from scratch
- Uninterrupted operation provided by hi-tech equipment such as UPS, power generator, RAID, lightning protection
- Mobile workstations for off-line data acquisition and system maintenance
- State-of-the-art software GeoDAS software with special modules to cope with the system requirements

Istanbul Metropolitan Earthquake Early Warning and Rapid Response System



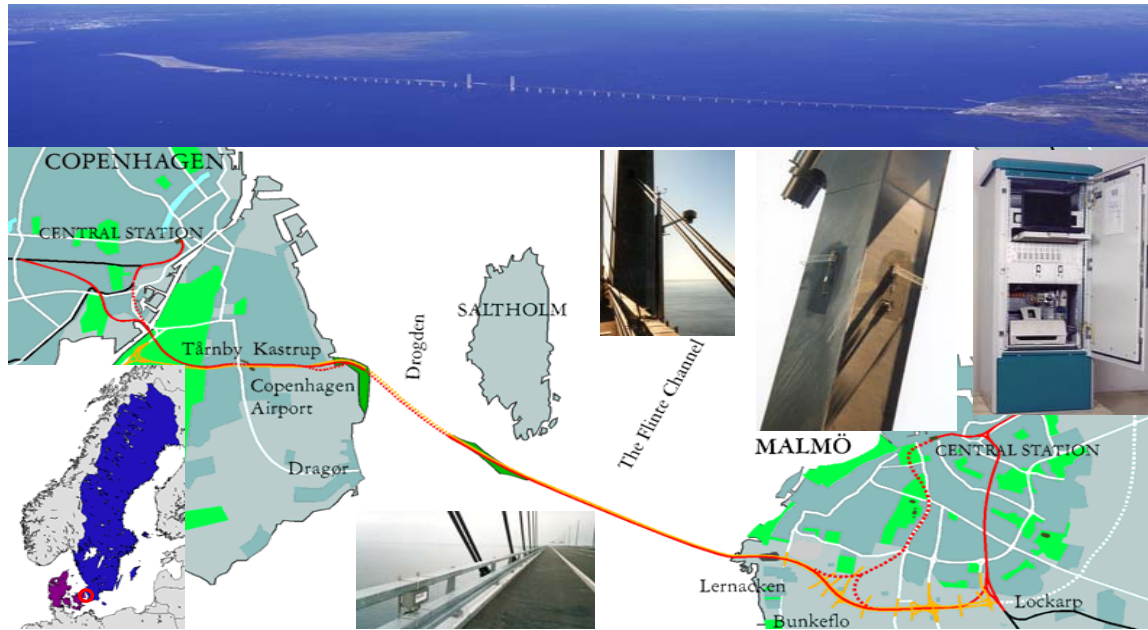
Axes	456
Sensors	152
Digitisers / Recorders	12 Online 100 Dial Up 40 Offline
Communication	<ul style="list-style-type: none"> • Spread Spectrum • GSM • Cable
System Center	1 main 1 secondary 4 auxiliary
Project Value (1'000 US\$)	2'000
Duration (weeks)	52
Completion Year	2002
Country	Turkey



Outputs

- Real-time continuous data streams and state of health information of the Early Warning stations
- Early Warning message to be used for generation of an alarm signal in case of a destructive earthquake
- Retrieval of the recorded waveforms via event or user triggered dial-up connection to the Rapid Response stations
- Rapid Response reports and shake maps transmitted to auxiliary centers and relevant agencies & officials
- Periodical state of the health checks, remote station setup, continuous system statistics, off-line data processing

Øresund Cable Stayed Bridge Structural Monitoring System



Axes	105
Sensors	55
Digitisers / Recorders	1
Communication	Cable
Project Value (1'000 US\$)	200
Completion Year	2000
Country	Denmark Sweden

Scope

- Impressive highway and railway link consisting of:
 - a 3'510 m immersed tunnel,
 - a 3'750 m artificial island, and
 - a 7'845 m combination bridge
- Observation of the oscillations of the cables of the 1'092 m cable stayed bridge under heavy wind conditions
- Monitoring the deflections of the bridge under the loads generated by the highway and railway traffic
- Notification of the traffic control center of the bridge in case of exceedance of threshold values

Øresund Cable Stayed Bridge Structural Monitoring System

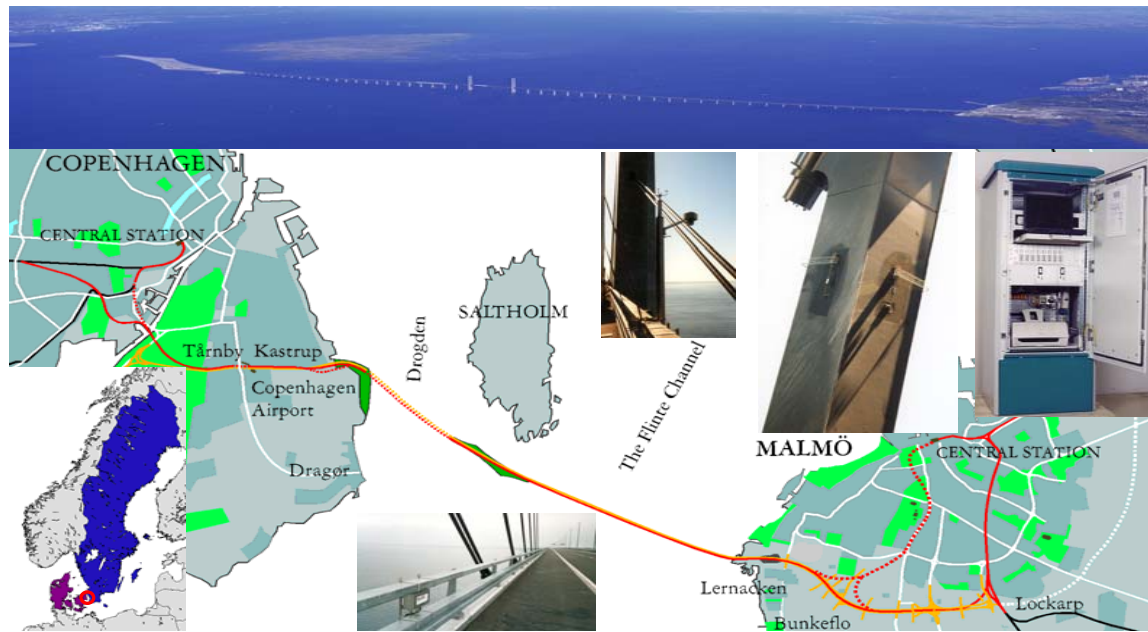


Axes	105
Sensors	55
Digitisers / Recorders	1
Communication	Cable
Project Value (1'000 US\$)	200
Completion Year	2000
Country	Denmark Sweden

System

- 105 channels and a data acquisition and processing center
- digital RS-485 cable communication
- 15 hours autonomy in case of power failure
- Temperature/environmental data correlation with strain gage measurements
- Single CR-4 PC-based recording system running programs:
 - SEISLOG: data acquisition
 - CENTRAL: remote access, CMS: static data processing
- Telephone line connection to the traffic control center for data, event and alarm transmission

Øresund Cable Stayed Bridge Structural Monitoring System



Axes	105
Sensors	55
Digitisers / Recorders	1
Communication	Cable
Project Value (1'000 US\$)	200
Completion Year	2000
Country	Denmark Sweden

Output

- Data from all sensor types are recorded by a single CR-4 PC-based recording system
- CR-4 displays the waveform and operating status of all dynamic data channels, status of the trigger and other parameters
- Every event file and every new portion of the static data is delivered to the traffic control center
- SOH, event files, static data and other information about CR-4 system can also be requested from traffic control center

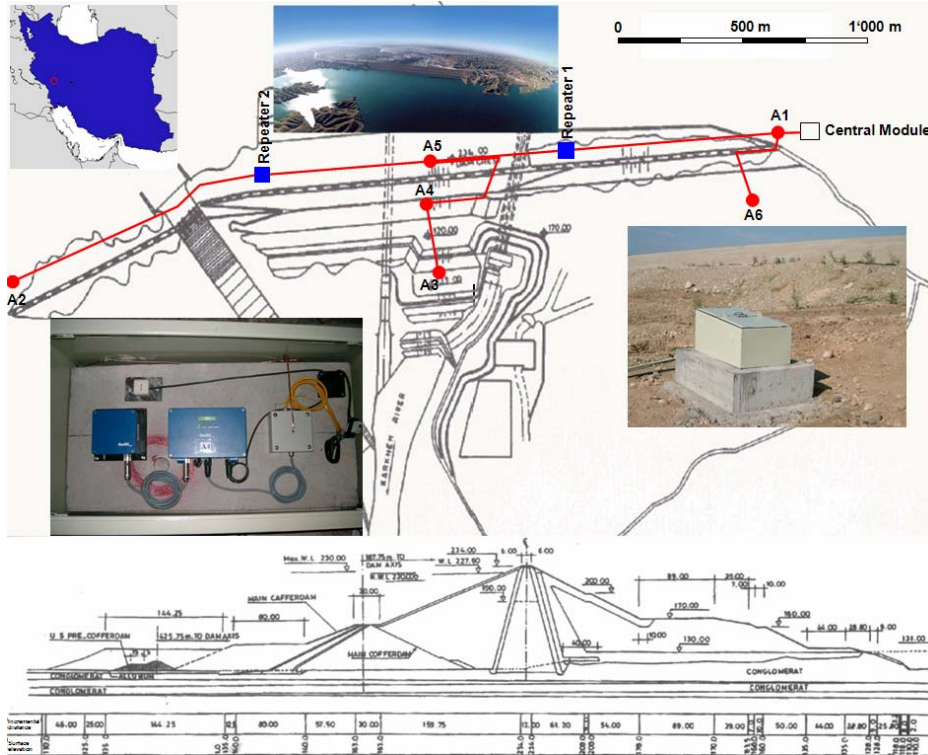
Øresund Cable Stayed Bridge Structural Monitoring System



Axes	105
Sensors	55
Digitisers / Recorders	1
Communication	Cable
Project Value (1'000 US\$)	200
Completion Year	2000
Country	Denmark Sweden

Qty	Total Channels	Model	Type	Measuring Range	Dynamic	Static
22	66	AC-63	Triaxial force-balanced Accelerometer	± 2 g	YES (100 SPS)	Min Max Mean
19	19	ES	Uniaxial strain gage	- 2000 .. 2000 mm/m	YES (100 SPS)	Min Max Mean
12	12	TE	Temperature Sensor	- 40 .. 80 °C	NO	YES
2	8	WST	Weather Station: Wind direction sensor Wind speed sensor Air humidity sensor Temperature sensor	0 .. 360° 0 .. 100 m/s 0 .. 100 %RH - 40 .. 80 °C	NO	YES

Karkheh Dam Seismic Instrumentation Network



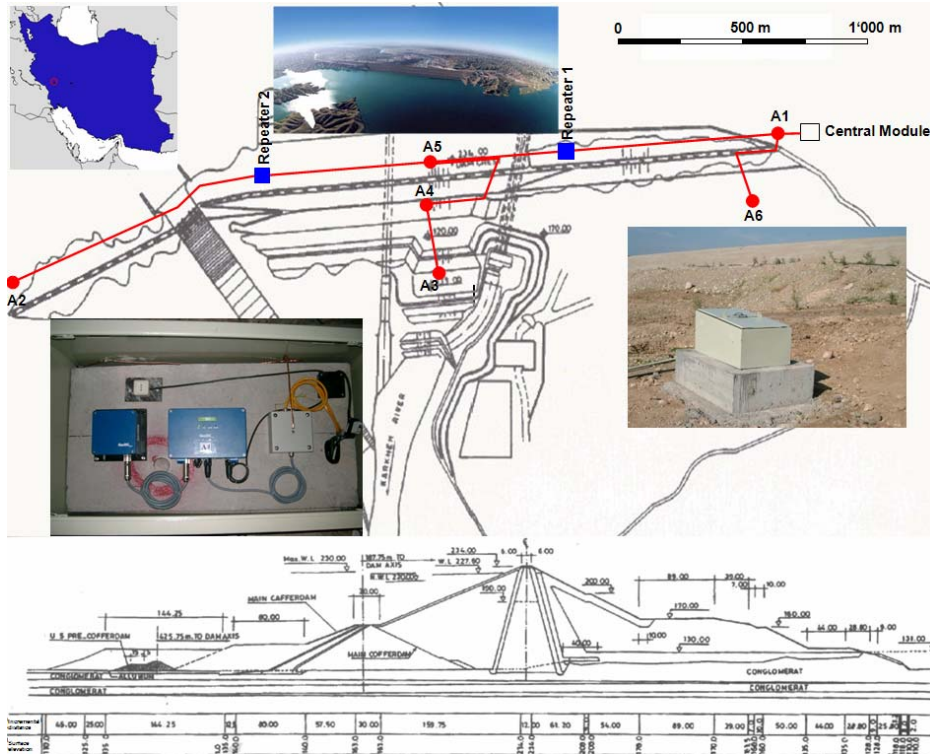
Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	Cable / Modem
System Center	Central Station
Project Value (1'000 US\$)	60
Duration (weeks)	25
Completion Year	2003
Country	Iran

Scope

Dam safety monitoring against seismic motions, reservoir effects, and other ambient dynamic loads to:

- Evaluate and observe structural safety and integrity,
- Assess and compare the dam behaviour against the seismic design criteria,
- Develop and improve emergency measures as well as awareness,
- Contribute to regional seismic database.

Karkheh Dam Seismic Instrumentation Network

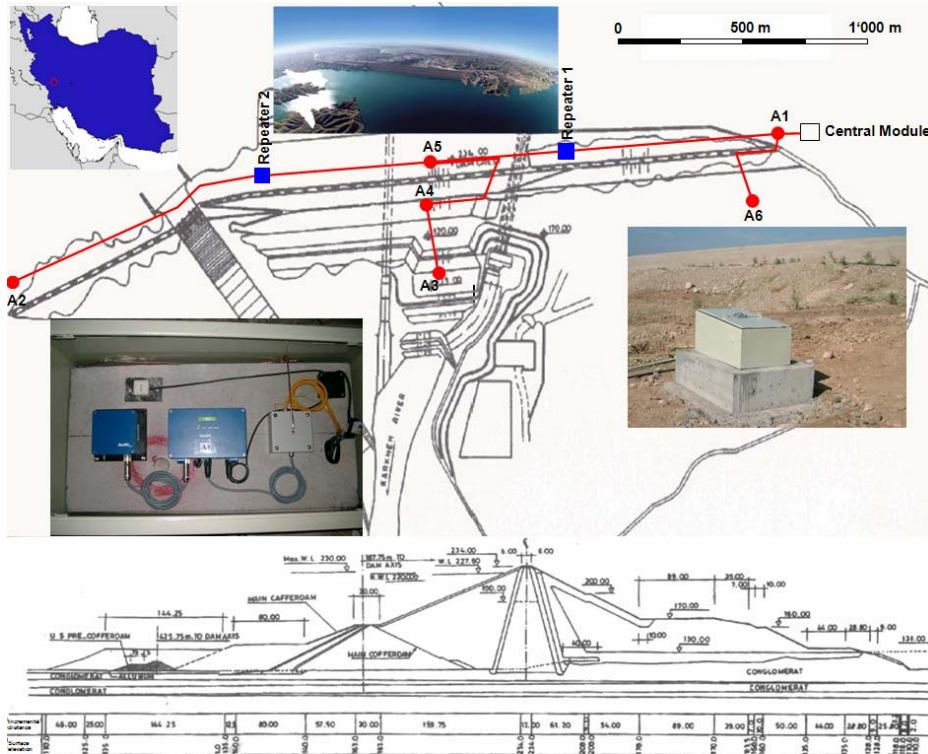


Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	Cable / Modem
System Center	Central Station
Project Value (1'000 US\$)	60
Duration (weeks)	25
Completion Year	2003
Country	Iran

System

- AC-63 force balance accelerometers and GSR-18 18 Bit digitiser/recorders
- RS-485 communication over more than 3 km distance
- 18 channels and a central station module
- An interconnection cable providing common timing, common trigger and communication to all stations
- Alternative access can be achieved through a modem connection
- Steel station cover, providing full protection while maintaining easy access

Karkheh Dam Seismic Instrumentation Network

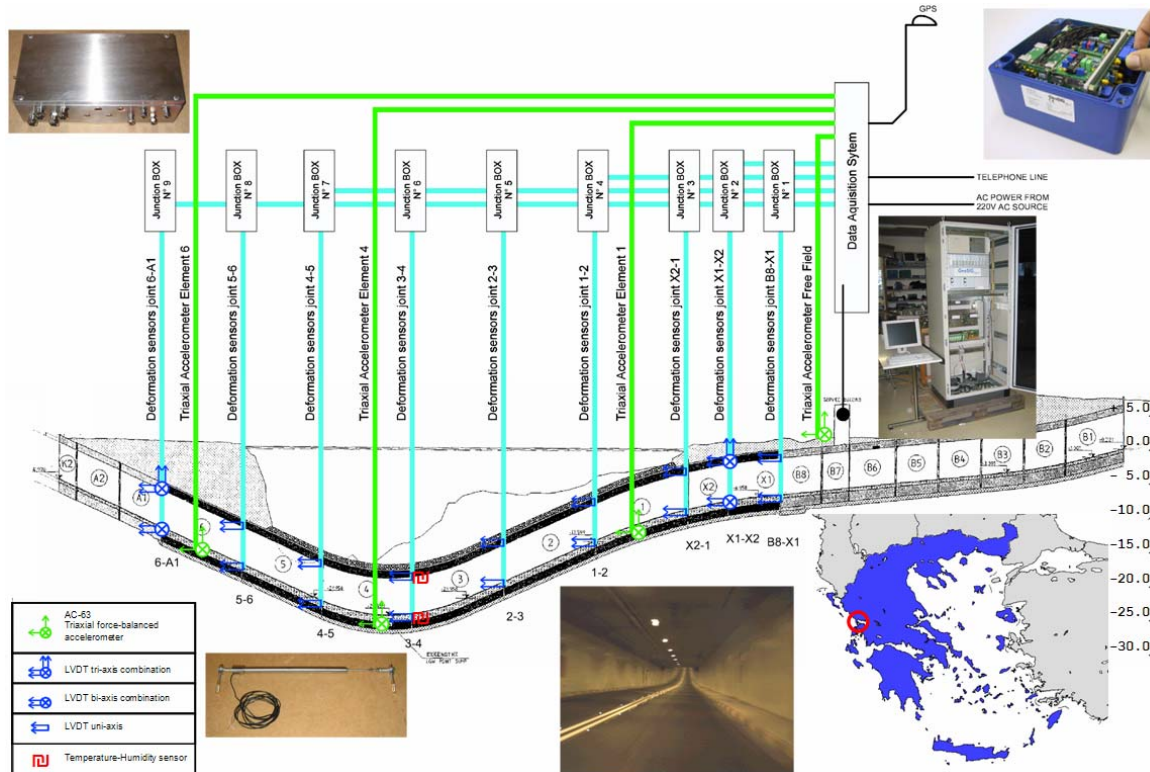


Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	Cable / Modem
System Center	Central Station
Project Value (1'000 US\$)	60
Duration (weeks)	25
Completion Year	2003
Country	Iran

Outputs

- Data is stored on event basis in case a dynamic event is detected

Preveza Immersed Tunnel Seismic and Joint Displacement Monitoring System

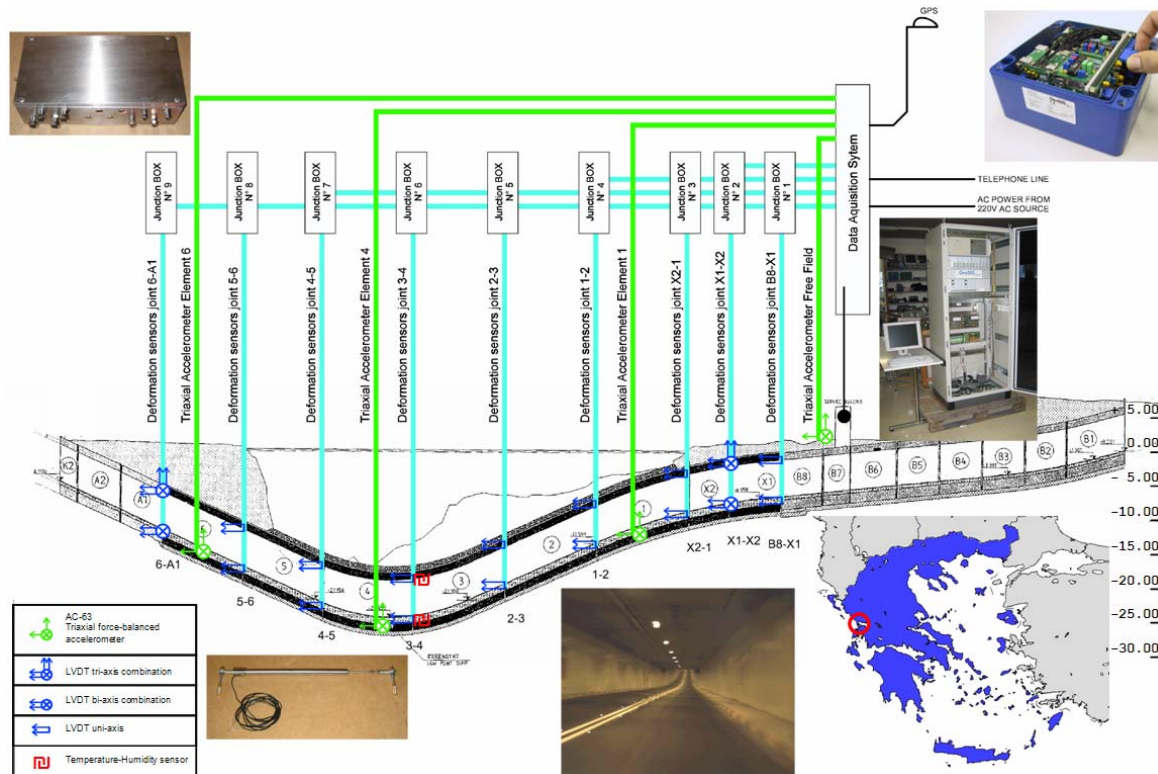


Axes	60
Sensors	50
Digitisers / Recorders	1 Central
Communication	Cable / Modem
System Center	1 PC Based
Project Value (1'000 US\$)	125
Duration (weeks)	10
Completion Year	2002
Country	Greece

Scope

- Tunnel monitoring against ambient static and dynamic loads as well as seismic effects
- Expansion or contraction surveillance due to environmental changes, at immersed tunnel section joints
- Deflections or relative displacements due to other static and dynamic ambient effects, including seismic activity

Preveza Immersed Tunnel Seismic and Joint Displacement Monitoring System

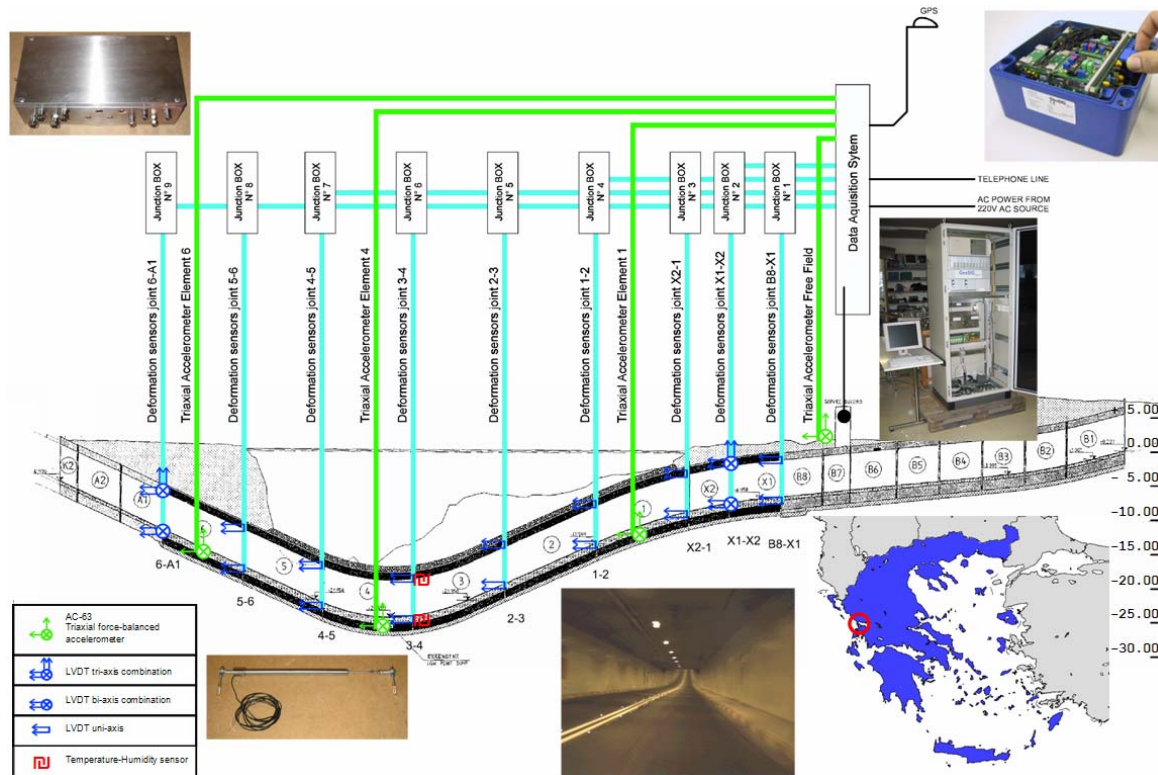


Axes	60
Sensors	50
Digitisers / Recorders	1 Central
Communication	Cable / Modem
System Center	1 PC Based
Project Value (1'000 US\$)	125
Duration (weeks)	10
Completion Year	2002
Country	Greece

System

- 60 channels and a data acquisition and processing center
- Temperature-humidity data correlation with static measurements
- Single CR-4 PC-based recording system
- Data from all sensor types (dynamic only, static and dynamic or static only) are recorded

Preveza Immersed Tunnel Seismic and Joint Displacement Monitoring System

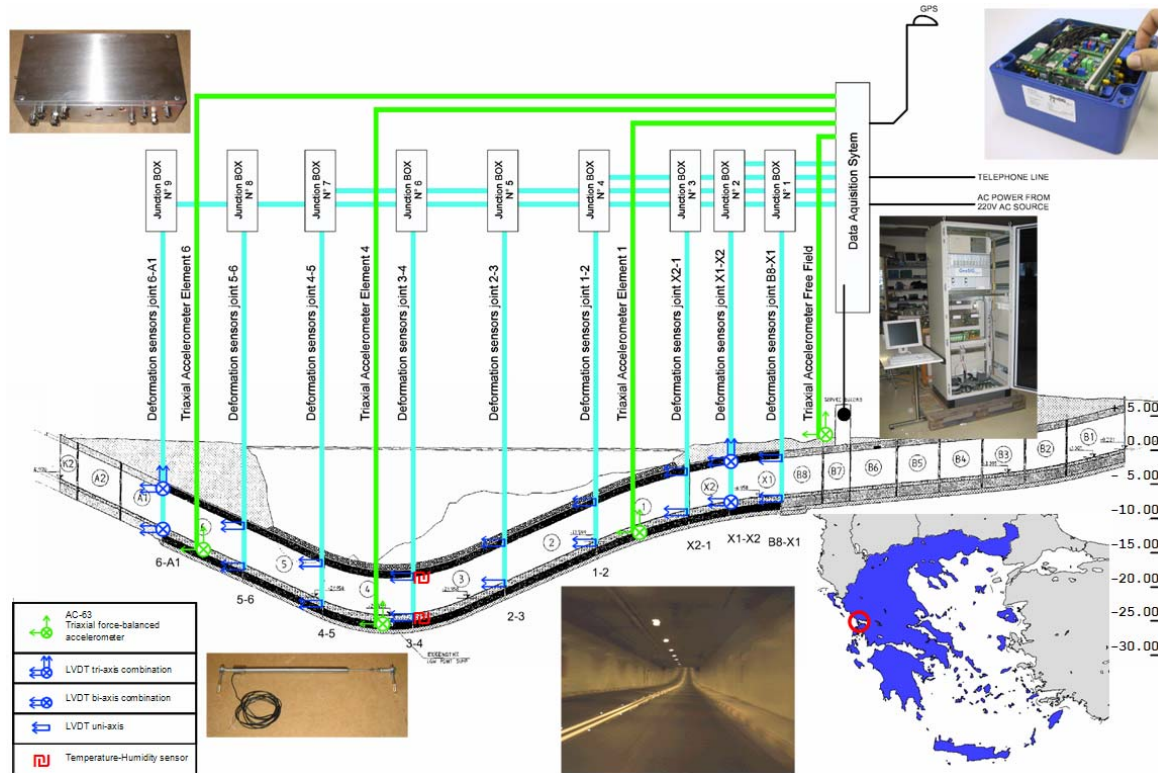


Axes	60
Sensors	50
Digitisers / Recorders	1 Central
Communication	Cable / Modem
System Center	1 PC Based
Project Value (1'000 US\$)	125
Duration (weeks)	10
Completion Year	2002
Country	Greece

Outputs

- Static: One value is stored at every specified interval, programmable from 5 minutes to 1 day
- Dynamic: Data is stored on event basis in case a dynamic event is detected
- Immediate response to detected emergency cases, at the tunnel service building

Preveza Immersed Tunnel Seismic and Joint Displacement Monitoring System



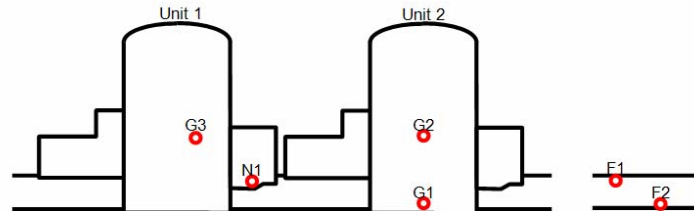
Axes	60
Sensors	50
Digitisers / Recorders	1 Central
Communication	Cable / Modem
System Center	1 PC Based
Project Value (1'000 US\$)	125
Duration (weeks)	10
Completion Year	2002
Country	Greece

Qty	Total Channels	Model	Type	Measuring Range	Dynamic	Static
4	12	AC-63	Triaxial force-balanced accelerometer	±2 g	YES (200 sps)	NO
44	44	LVDT	Uniaxial displacement sensor	-50 ~ +100 mm	YES (200 sps)	YES
2	4	HU-TE	Temperature-Humidity sensor	-40 ~ 60 °C 0 ~ 100 %RH	NO	YES

Beznau Nuclear Power Plant Seismic Instrumentation Network



Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	FO Cable
System Center	1 Data Center
Project Value (1'000 US\$)	160
Duration (weeks)	40
Completion Year	2003
Country	Switzerland



- F1: Freefield at surface
- F2: Freefield on bedrock
- N1: State of Emergency building, mat foundation
- G1: Security building, mat foundation
- G2: Security building, operation floor level 340
- G3: Security building, operation floor level 340

Scope

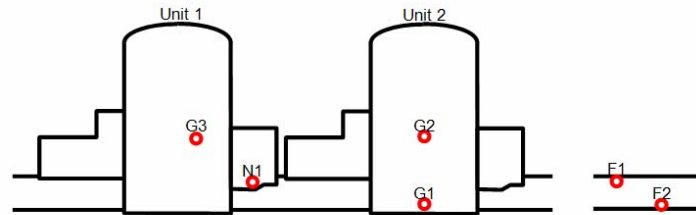
Nuclear Power Plant (NPP) safety monitoring against seismic motions, and other ambient dynamic loads to:

- Evaluate and observe structural safety and integrity as well as safe operation,
- Assess and compare the behaviour against the seismic design criteria,
- Develop and improve emergency and safety measures as well as awareness,
- Contribute to regional seismic database.

Beznau Nuclear Power Plant Seismic Instrumentation Network



Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	FO Cable
System Center	1 Data Center
Project Value (1'000 US\$)	160
Duration (weeks)	40
Completion Year	2003
Country	Switzerland



- F1: Freefield at surface
- F2: Freefield on bedrock
- N1: State of Emergency building, mat foundation
- G1: Security building, mat foundation
- G2: Security building, operation floor level 340
- G3: Security building, operation floor level 340

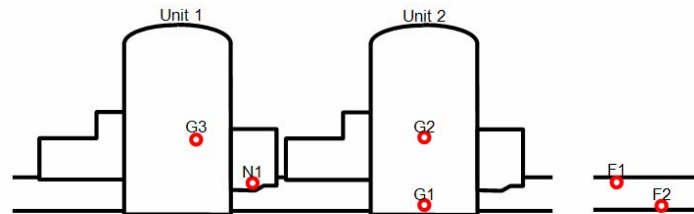
System

- AC-23 accelerometers, GSR-18 digitiser/recorders and one Central Processing Unit (CPU).
- All stations store the motion signals detected by the sensors in local recorders, for redundancy.
- GeoDAS software is utilised to:
 - monitor the stations,
 - download event recordings automatically,
 - check system state of health, which can be used to analyze the detailed cause of any malfunction,
 - analyze downloaded data by means of seismic and OBE/SSE checks,
 - issue alarms.
- Alarm transmission and communication between stations and the CPU via fiber-optic cable.
- Self-monitoring and testing facilities for periodic testing of the entire measurement chain.

Beznau Nuclear Power Plant Seismic Instrumentation Network



Axes	18
Sensors	6
Digitisers / Recorders	6
Communication	FO Cable
System Center	1 Data Center
Project Value (1'000 US\$)	160
Duration (weeks)	40
Completion Year	2003
Country	Switzerland

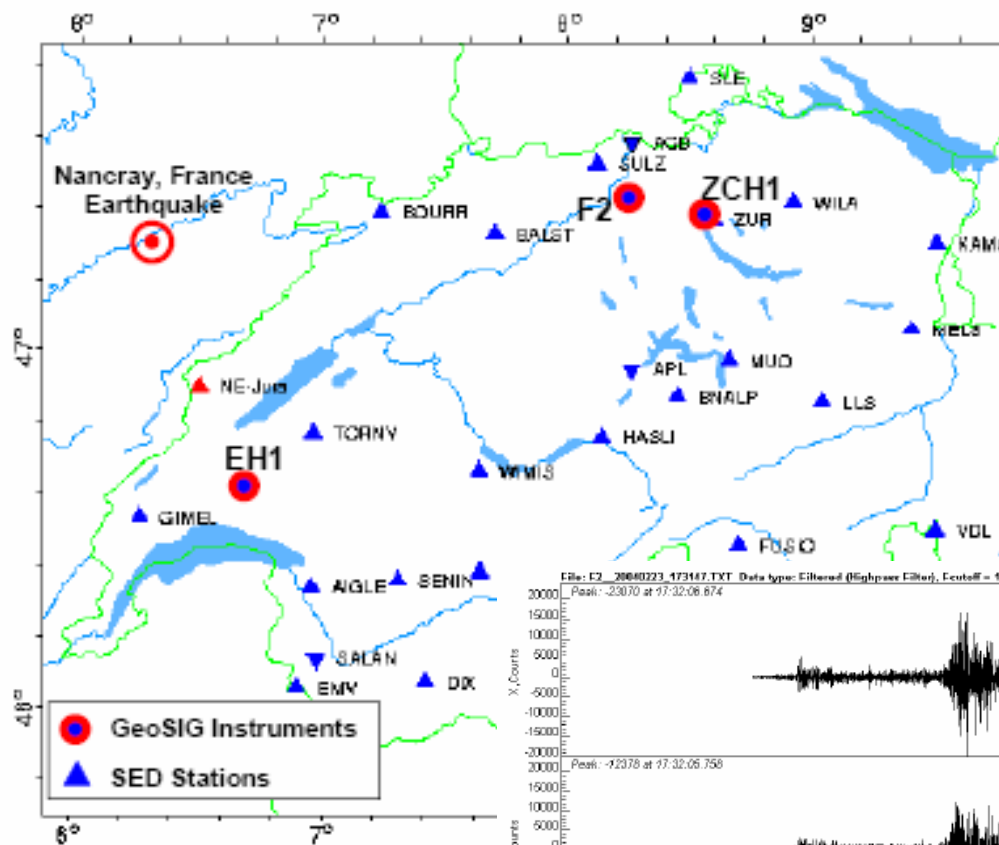


- F1: Freefield at surface
- F2: Freefield on bedrock
- N1: State of Emergency building, mat foundation
- G1: Security building, mat foundation
- G2: Security building, operation floor level 340
- G3: Security building, operation floor level 340

Outputs

- Three alarm levels: trigger, calculated (OBE based on RSA/RSV and CAV), system failure
- Laser printed seismic event records including 3 component time-history and RSA, RSV and CAV plots with limits.
- Data is stored on event basis in case a dynamic event is detected.

Beznau Nuclear Power Plant Seismic Instrumentation Network



Seismograms start at 2004/02/23 17:31:25.00 UTC Seismic Event File: KP200402231730
 Manual Location: 20040223 17:31:21.3 47.2N 6.9E M= 4.9 Qual=A Nancray / France
 Filters: BP 3rd: 1.00Hz 20.00Hz

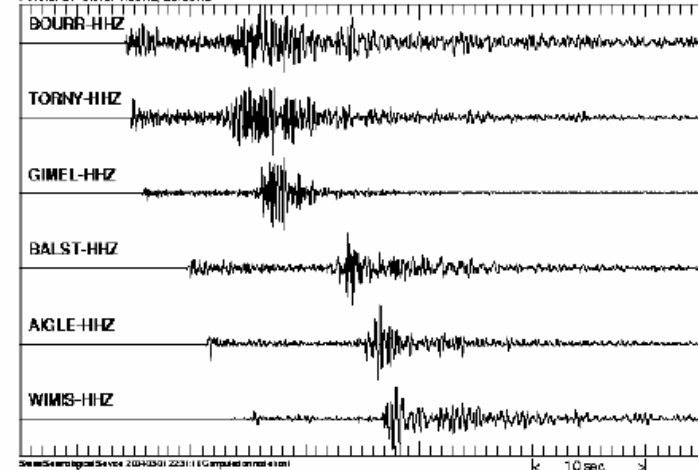


Figure 5. Records of the six SED stations

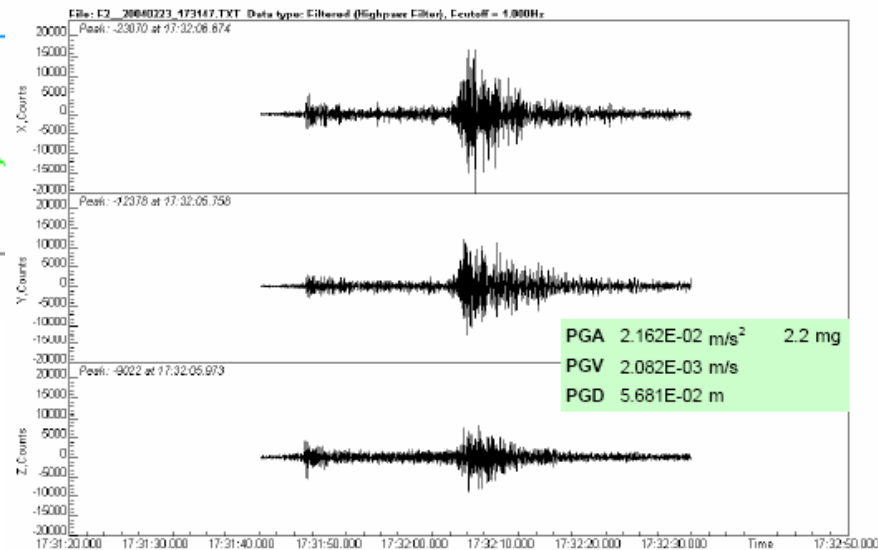
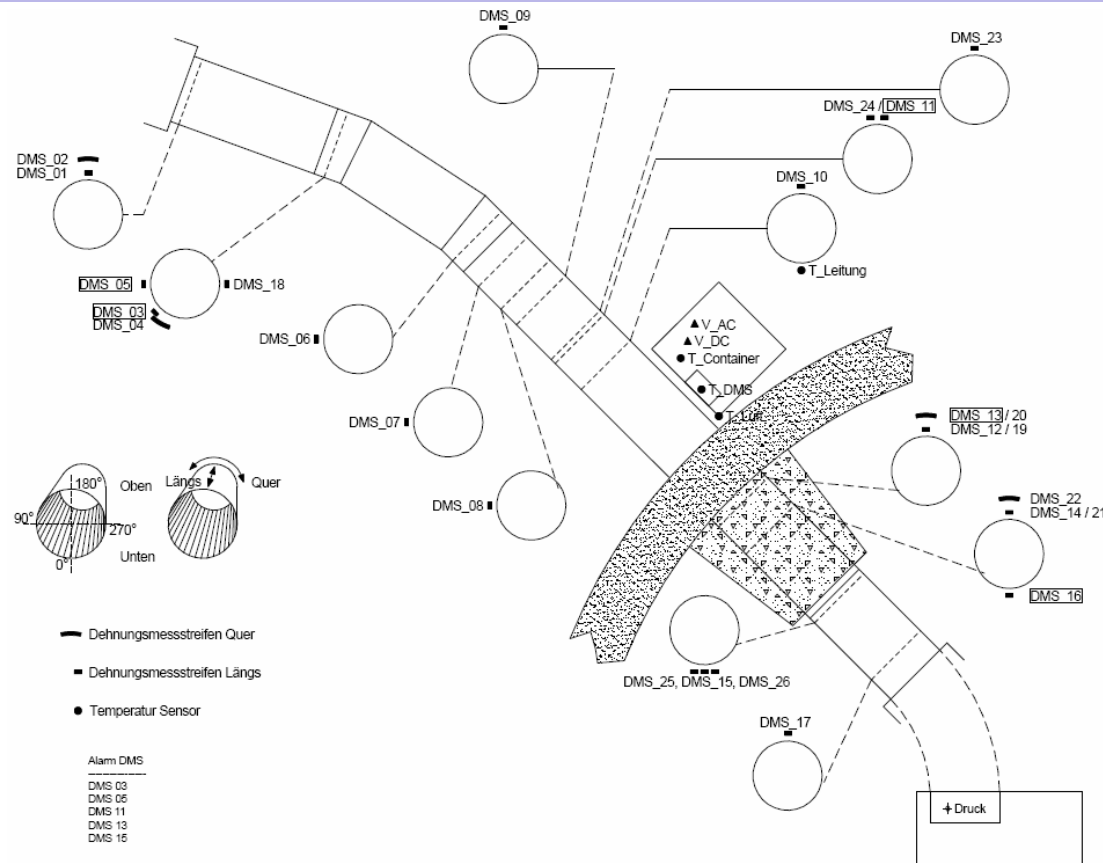


Figure 3. Station F2 at Beznau NPP (AC-23 & GSR-18)

Penstock Monitoring System SN-Energie, Schwanden



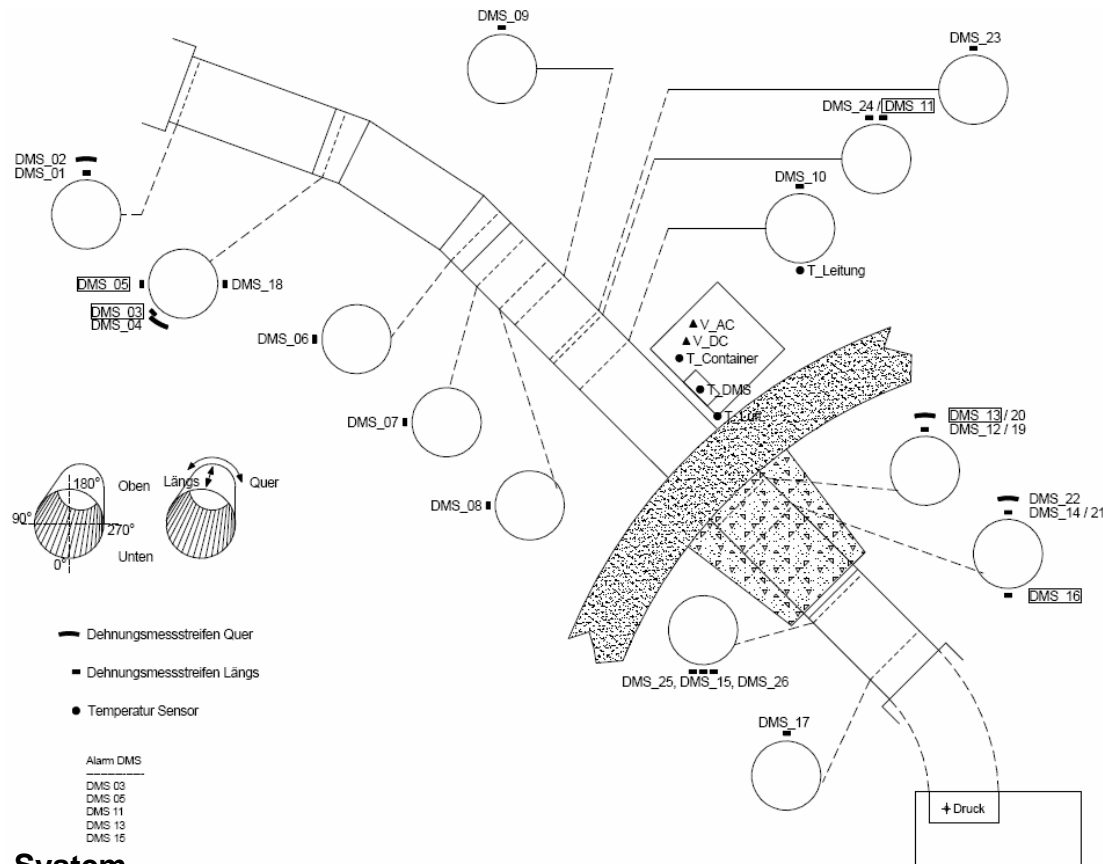
Axes	32
Sensors	30
Digitisers / Recorders	1 CR-5
Communication	Modem / SMS
System Center	1 Data Center
Project Value (1'000 US\$)	120
Duration (weeks)	2
Completion Year	2004
Country	Switzerland



Scope
Safety Monitoring System for repaired Penstock



Penstock Monitoring System SN-Energie, Schwanden

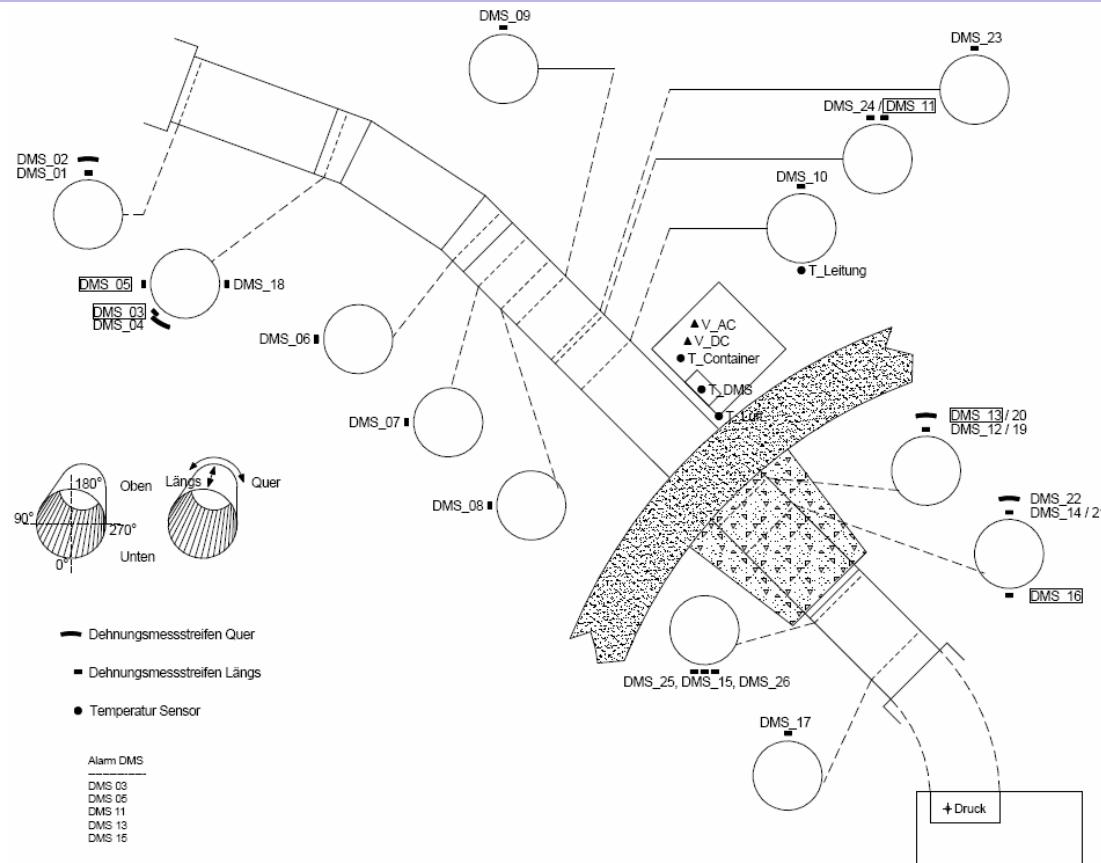


Axes	32
Sensors	30
Digitisers / Recorders	1 CR-5
Communication	Modem / SMS
System Center	1 Data Center
Project Value (1'000 US\$)	120
Duration (weeks)	2
Completion Year	2004
Country	Switzerland

System

- CR-5 system
- 26 Strain Gauges installed, 22 monitored
- 3 axis acceleration (AC-23)
- 4 Temperature sensors
- 1 Pressure sensor
- AC- and DC-Power monitoring

Penstock Monitoring System SN-Energie, Schwanden

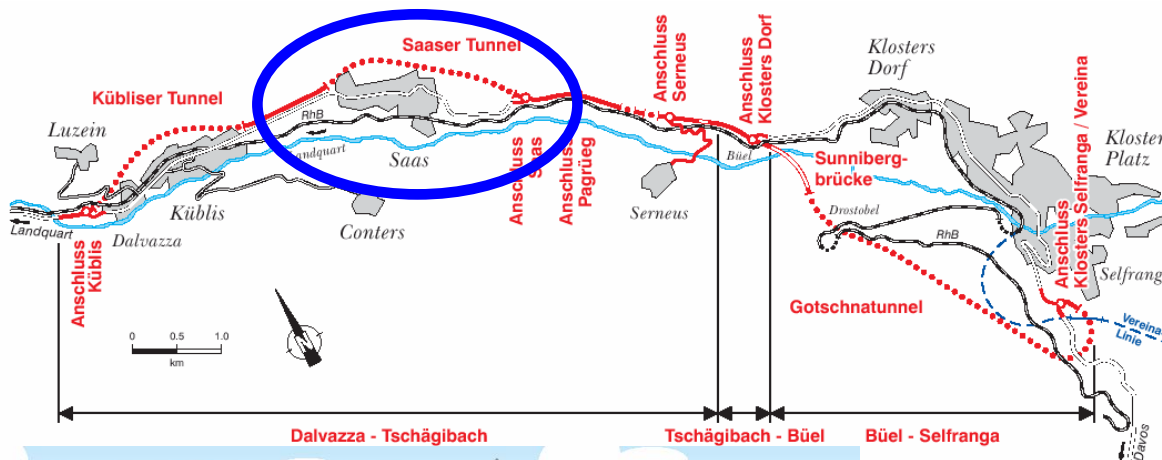


Axes	32
Sensors	30
Digitisers / Recorders	1 CR-5
Communication	Modem / SMS
System Center	1 Data Center
Project Value (1'000 US\$)	120
Duration (weeks)	2
Completion Year	2004
Country	Switzerland

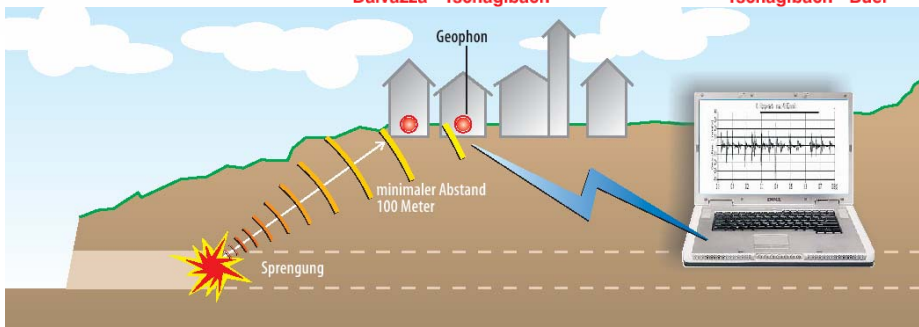
Outputs

- SMS Alarms on preset levels, AC failure, DC failure
- static data (1 dataset / minute)
- dynamic data (10 SPS)

Dynamic Monitoring System for Saaser Tunnel



Axes	21
Sensors	7
Digitisers / Recorders	1
Communication	Internet
System Center	1 Data Center
Project Value (1'000 US\$)	40
Duration (weeks)	140
Completion Year	2010
Country	Switzerland



Scope

Vibration monitoring during tunnel construction



Tainan Science Park / Taiwan High Speed Train Vibration Monitoring



Axes	2 x 60
Sensors	2 x 20
Digitisers / Recorders	2 CR-5
Communication	LAN
System Center	1 Data Center
Project Value (1'000 US\$)	300
Duration (weeks)	20
Completion Year	2005
Country	Taiwan



Scope

- Measuring High Speed Train induced vibration at different distances (up to 800 m)
- Measuring effect of cut off wall

Tainan Science Park / Taiwan High Speed Train Vibration Monitoring



Axes	2 x 60
Sensors	2 x 20
Digitisers / Recorders	2 CR-5
Communication	LAN
System Center	1 Data Center
Project Value (1'000 US\$)	300
Duration (weeks)	20
Completion Year	2005
Country	Taiwan

System

- CR-5 system
- 60 channels
- 20 ea. VE-13 velocity sensors with gain ranging
- 1000 SPS permanent data recording
- Integration into Monitoring LAN

Tainan Science Park / Taiwan High Speed Train Vibration Monitoring

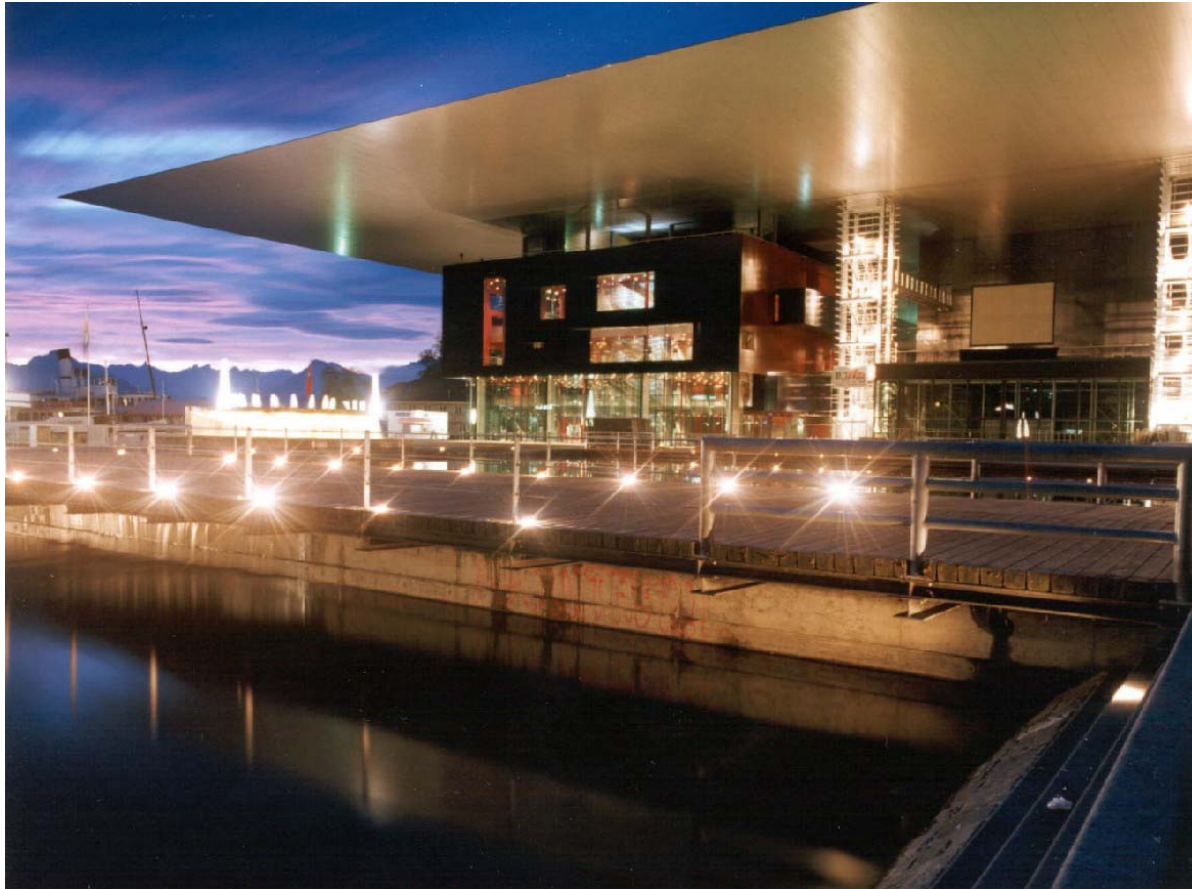


Axes	2 x 60
Sensors	2 x 20
Digitisers / Recorders	2 CR-5
Communication	LAN
System Center	1 Data Center
Project Value (1'000 US\$)	300
Duration (weeks)	20
Completion Year	2005
Country	Taiwan

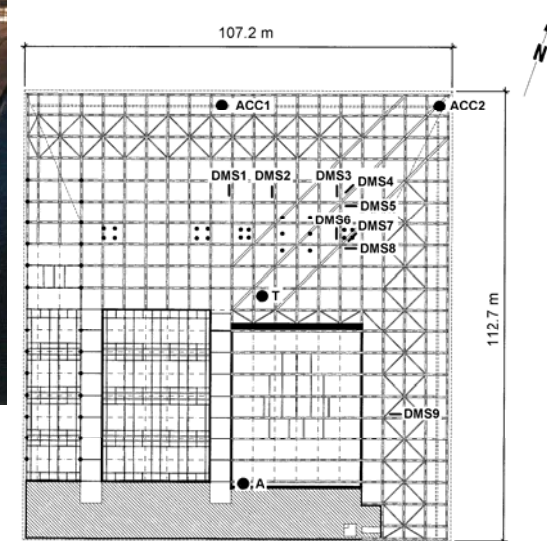
Outputs

- Train vibration data of 20 sensor locations (per system) at 1000 SPS

Roof Monitoring Kultur und Kongresszentrum Luzern (KKL)



Axes	17
Sensors	17
Digitisers / Recorders	1
Communication	Modem
System Center	1 Data Center
Project Value (1'000 US\$)	60
Duration (weeks)	ongoing
Completion Year	1999 - ...
Country	Switzerland



Scope

Dynamic and static roof monitoring
Alarms in case of exceedance of predefined limits