

Curriculum Vitae

Name of the company	: Skat Consulting Ltd., St. Gallen, Switzerland
Name of staff	: FEIBEL Hedi
Profession	: Development Cooperation Specialist, Energy Specialist, Hydrologist, PhD
Date of birth	: 9th December 1966
Nationality	: German

KEY QUALIFICATIONS

Hedi Feibel has 25 years of experience in the water-energy-environment sector in development co-operation in different African, Asian and Central American countries, as a hydrologist, energy expert, project manager and programme designer.

- Expert on project design, planning, management, monitoring and evaluation as well as conducting of impact analyses
- Expert on interdisciplinary approaches for energy and electrification projects in developing countries, considering consumption patterns, productive use of energy, tariff systems, demand side management and load forecast, legal and policy aspects, investment and operating costs, profitability, financing mechanisms, project participants, organisation forms and institutional set-up for operation and management
- Expert on energy and water projects, including technical surveys, assessment of hydropower potential, socio-economic and environmental aspects (including mitigation measures), demand projections and market analyses, economic and financial analyses
- Expert on hydrological monitoring (discharge, rainfall etc.), including planning and installation of gauging stations; statistical data evaluation and hydrological assessment
- Capacity building expert for hydrological aspects, operational and management issues
- Knowledge and experience in international financing mechanisms (Flexible Mechanisms like JI, CDM and ET), GEF programme, Prototype Carbon Fund etc.
- Experience in mini grid systems based on renewables
- participatory planning approaches

EDUCATION

1998 – 2003	PhD student and graduation at the Department of Civil Engineering (Hydrology and Water Management) and Department of Political Economy, Darmstadt University of Technology, Germany PhD topic: “An Interdisciplinary Approach to the Dissemination of Mini and Micro Hydropower - the Case of Ethiopia”
1985 – 1992:	MSc Geography / Hydrology, Institute of Hydrology, University of Freiburg, Germany Thesis: “The hydrological storage dynamics of Mount Kenya”

LANGUAGES

	<i>speaking</i>	<i>reading</i>	<i>writing</i>
German (mother tongue)	excellent	excellent	excellent
English	excellent	excellent	excellent
French	excellent	excellent	very good
Spanish	basic	fair	basic
Indonesian	fair	good	fair

Specific country experience

<u>Country</u>	<u>Year</u>	<u>Country</u>	<u>Year</u>
Albania:	2007, 2008	Kyrgyzstan:	2015
Benin:	1993, 1994	Laos:	2012
Burkina Faso:	1997, 2011	Liberia:	2012, 2013
Burundi	2012	Mali:	1995, 1996, 2005, 2007
Cameroon:	1994	Morocco:	2003, 2015
Caribbean:	2005	Nepal:	2003, 2004, 2005, 2010, 2016
Chad:	1995	Rwanda	1992, 2012
China:	1998	Tajikistan:	2005, 2006, 2007, 2008, 2009
DR Congo:	2010, 2012, 2013	Tanzania:	2013
Ethiopia:	1999, 2000, 2001, 2008, 2013, 2014	Togo:	1992, 1993, 1994
Germany:	1993, 1997, 1998	Tunisia:	2012
Ghana	2015, 2016	Vietnam:	2004, 2006
Guinea	2016		
Indonesia	1990, 2006, 2007, 2008, 2009, 2010, 2011		

PROFESSIONAL EXPERIENCE

Skat Consulting Ltd., St Gallen, Switzerland

March 2012- ongoing

Team member in the « Energy and Climate Change » Department

Tasks:

- Specialist consulting services in all aspects of rural electrification, renewable energy development and water supply in developing countries
- Specialist consulting services in project planning, management, monitoring and evaluation especially in the fields of hydropower, water supply and water resources management

Main activities / Projects :

- Deputy team leader for the Backstopping for the "Ghana Electricity Sector Support Project" within the framework of the 3rd phase of the Ghana Energy Development and Access Program (GEDAP III); assistance in project planning, institutional strengthening of electricity utilities, extension of distribution infrastructure, support of renewables (RE) and promoting energy efficiency (EE) measures; **Ghana** (State Secretariat for Economic Affairs / Switzerland SECO, 2015-2020)
- "[Swiss Small Hydro](#)" – Development of a future strategy for the association; support of the process for the development of a future strategy; online survey among members, semi-structured phone interviews of key stakeholders, preparation and facilitation of a strategy workshop, **Switzerland** (Swiss Small Hydro, 2016/2017)
- Preparation and implementation of the "Hydropower O & M Workshop" supported by SECO and World Bank in Martigny, Switzerland, under the "Swiss Water Partnership SWP"; support of hydropower operators from countries in the South to develop case studies to be presented,

development of a workshop concept and reporting, **Switzerland** (Swiss Water Partnership, 2016)

- Support of and cooperation with the [Hydro Empowerment Network HPNET](#) with regard to the restructuring of the network and the preparation of the annual gathering in Kathmandu, Nepal (Skat Project Fund, 2016/2017)
- Regional assessment of the potential for retrofitting small hydropower capacity at existing barrages / dams in SADC countries; analysis of political, legal, regulatory and economic frame conditions in all SADC countries, specification of selection criteria and country prioritisation (e.g. electrification rate, generation deficit, feed-in tariff, net metering, grid-code, average electricity generation cost, tariff scheme). Parallel analyses of retrofitting potential based on FAO Aquastat database on dams and irrigation areas to finally provide a ranking of potential sites and recommendations for follow-up, **SADC countries** (GIZ, 2016)
- Creating a program document on upgrading the hydro-meteorological network and database for small-scale hydro power (< 30 MW) in Guinea and Sierra Leone on behalf of the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). Provided services: rapid literature and data review, field reconnaissance (baseline data, current institutional setup, exchange with relevant stakeholders, training needs assessment) and establishment of a Program Document with consistent and efficient measures to upgrade/build up a network and maintain it (activities, timeline, budget), **Guinea & Sierra Leone** (ECREEE, 2016)
- Backstopper to the a) PSP Hydro Project of GIZ / Rwanda (PSP = Private Sector Participation in Hydropower Development) and b) Promotion of Private Sector Investment in Village Grids; evaluation of three draft project proposals (300 kW – 1.3 MW) with regard to cost efficiency (load factor, CAPEX, OPEX, revenues etc.) and technical aspects; advisory service on detailed technical designs and during construction monitoring of mini grids, **Rwanda** (GIZ, 2016)
- Swiss representative and IEA Photovoltaic Power Systems PVPS “Task 9” project’s co-manager (Operating Agent); within this Task 9 which is working on “Deployment of PV in Emerging Countries” main activities in the fields of hybrid mini grids and distributed generation, as well as strategic positioning of Task 9 in the future, enhancing partnerships with other international organisations and improvement of Task 9 visibility; **International** (REPIC, 2015-2017)
- Backstopper to the PSP Hydro Project of GIZ / Rwanda (PSP = Private Sector Participation in Micro-Hydro Power Supply for Rural Development, Rwanda): Assessment and recommendation on specific mini hydropower projects (technical design, economic analysis, management structure etc.) and thorough revision of 1) “design criteria for quality and safety” and 2) “commissioning checklist”, for micro hydro isolated village grids under the so-called “result-based financing”, **Rwanda** (GIZ, 2015)
- Coordination and contribution to the 6 Modules of the comprehensive “Documentation Mini and Small Hydro” on behalf of SFOE; complete drafting of Module 1: “Overview on Mini and Small Hydropower and Stakeholders” as part of the documentation. Module 1 comprises the history, development, importance and general information on mini and small hydropower in Switzerland, **Switzerland** (Swiss Federal Office of Energy SFOE, 2015-2017)
- Collection of hydrological data for small and medium hydropower climate risk assessment in Morocco. While the European Bank for Reconstruction & Development EBRD is considering to offer a loan of up to 40 Mio Euro to ONEE (national water and energy utility) for the rehabilitation of hydropower plants and dams, the main task of the assignment was to collect information for the assessment of current and future hydrological conditions of ONEE’s hydropower assets, to provide information on irrigation, on residual flow regulations and technical information on hydropower plants and to give recommendations on follow-up activities; **Morocco**, Posch + Partner, 2015
- “Program for the Promotion of Renewable Energies II”, Technical Assistance for the Construction and Rehabilitation of Small Hydro Power Plants and Support of the Bank of Georgia; Assessment / plausibility check of the hydrological study including quality of database, method of data evaluation and conclusions, risk assessment (wrong forecast), estimation of sediment transport, determination of environmental flow and of the flood flows; **Georgia**, KfW; 2015-2016
- Project planning for the Helvetas-supported project “Green Skills Training in Rural Areas G-STAR” (namely thermal insulation of buildings and energy efficient stoves) in Kyrgyzstan; participatory development of a logframe together with local team, exchange with key stakeholders in the

vocational training and energy sector, elaboration of Project Document including context, brief history, lessons learned, alignment of the project, description of logframe, implementation strategy, stakeholders & partners, human resources & budget), risk assessment and mitigation measures; **Kyrgyzstan** (Helvetas Swiss Intercooperation, 2015)

- Development of an “Overall Concept for the Establishment of a Comprehensive Mini and Small Hydropower Documentation”, **Switzerland / international** and “Evaluation of the Cost Structure of Small Hydropower Plants in Switzerland”, **Switzerland** (Swiss Federal Office of Energy, 2014)
- Evaluation of 19 proposals for renewable energy mini-grid projects (PV, hydropower, biomass, wind, hybrid) from different ECOWAS countries with regard to technical, economic and management aspects; establishment of an evaluation table with relevant criteria and of a summarising report; evaluation criteria include e.g. feasibility (technical and economic), sustainability (ownership, O&M and tariff structure, trainings etc.), relevance (addressing key challenges, synergies, avoid duplication etc.), impact (encourage productive use, multiplier effect, etc.), effectiveness (e.g. cost effectiveness, cost per installed kW, per household, per kWh etc.); **ECOWAS** (ECREEE, 2014)
- Support the PSP Hydro team (PSP = Private Sector Participation in Micro-Hydro Power Supply for Rural Development, Rwanda) in establishing a detailed evaluation matrix of project proposals (clear and transparent guidance regarding minimum requirements and number of points to be awarded); backstopping during the technical evaluation of submitted proposals, i.e. advice and assessments with specific technical questions Under this PSP hydro phase (2013-17), 9 Micro-Hydro Power plants are tendered out to Small and Medium-Sized Enterprises by the national utility EWSA. PSP Hydro supports the firms in the process of constructing and operating the systems; **Rwanda** (GIZ, 2014)
- Establishment of an evaluation matrix for technical, financial and economic scoring of mini and small hydropower project proposals from developers who applied for the cost covering feed-in tariff in Switzerland, **Switzerland** (Swiss Federal Office of Energy SFOE, 2014)
- “Nexus application in interventions of Austrian Development Cooperation in Ethiopia”: analysis of the application of a “nexus-like” approach, possible improvements drivers and barriers, entry points existing knowledge and capacity gaps with regard to the Nexus approach; besides the analysis on a more strategic policy level, the programme “Livelihood improvement through sustainable resource management in N-Gondar” and the project “Reducing land degradation and farmers’ vulnerability to climate change in the highland dry areas of north-western Ethiopia” were surveyed; **Ethiopia** (Austrian Development Agency ADA, 2014)
- Contribution to the preparation and reporting of the AGUASAN Workshop (June 2014) “Water challenges beyond WASH – bridging the water, food and energy sector divides; **Switzerland** (SDC, 2014)
- Preparation of a joint seminar proposal for the “World Water Week 2014”, Stockholm: case study on combined solutions for drinking water supply, irrigation, waste water and energy (own financing, 2014)
- Preparatory works and feasibility study for the establishment of a “Promotion Centre for Renewable Energies” in South Kivu for the “Biodiversity and Forest Programme PBF in DR Congo”; the general objective of the PBF is protection of biodiversity, sustainable management of tropical forests and improvement of the living conditions in protected areas and adjacent zones. The Centre is expected to bring together the different relevant stakeholders (networking), coordinate activities, offer training, attract micro-finance options for entrepreneurs etc. Main tasks of the consultancy are to do a stakeholder analysis, get an overview on activities in the sector, identify promising courses of action considering e.g. improved stoves, alternative combustibles like briquettes (made of agricultural residues, animal faeces etc.), biogas; energy efficiency, usage of PV systems, etc. and finally to establish a business plan for a sustainable operation of the Centre (required infrastructure, staff, equipment, task descriptions etc.), **DR Congo** (GIZ, 2013)
- Identification and characterisation of a number of small hydropower projects in the context of the “Scaling Up Renewable Energy Program (SREP) for low income countries” in Liberia. Being approved as a SREP pilot country Liberia was tentatively allocated a fund of up to USD 50 million to support the implementation of RE investments. The consultancy includes: review of documentation provided by AfDB, WB and RREA, review of benchmarks and selection criteria, site screening, hydrological study and capacity building, field visit for site assessment, cost and performance estimations and contribution to the SREP Concept Note, **Liberia** (African Development Bank,

2013)

- Quality check of mini hydro feasibility studies under the project “Private Sector Participation in Micro-Hydro Power Supply for Rural Development, Rwanda” (PSP hydro): Technical evaluation of feasibility studies for Mashyiga (180 kW), Maruruma (380 kW), Kavumu (380 kW) and other sites to provide a basis for approval of co-financing. Provision of technical advice on hydrological analysis, design of civil works and of electro-mechanical equipment, erosion protection, required rehabilitation measures, cost estimates, economic and financial analysis etc., recommendations on improvements of feasibility studies to facilitate their acceptance by donor agencies and banks and to increase the sustainability of O&M once the systems are implemented; **Rwanda** (GIZ, 2013)
- Evaluation of the added value of the so-called “Swiss Water & Sanitation NGO Consortium”. The Consortium is a programme jointly developed by 8 Swiss NGOs within the framework of the 0.5% Message of the Swiss Parliament. The programme aims at improving the living conditions of populations in rural areas in countries lagging far behind the MDG target for water and sanitation. It is running from Aug 2011 to Dec 2013 with a budget of 19.145 mio. CHF. In 16 countries, the Consortium implements 27 projects having been designed as extensions or scaling-up initiatives of on-going projects. The evaluation concerns the East African part of the activities, **Ethiopia** (SDC, 2013)
- Desk Study on Framework and Investment Conditions for Small Hydropower (< 10 MW) in Bulgaria, Romania, Slovenia and Slovakia; analysis and comparative assessment of current electricity supply, role of hydropower, future potential of small hydropower, important stakeholders in the sector, energy policy, legal framework (feed-in tariff systems, quota and green certificates etc.) and investment support in all 4 countries, **Bulgaria, Romania, Slovenia, Slovakia** (Sol-E Suisse AG, 2013)
- Feasibility Studies for six Mini-Hydropower Projects in Tanzania; support of 6 MHP project developers in building their capacity to access financing by assisting them with completing comprehensive feasibility studies; combined capacity of about 7.5 MW; evaluation and assessment of existing studies and preliminary hydrological investigations, site investigations, support to install and operate gauging stations for water level and flow measurement; training of local staff, evaluation of existing information, studies and hydrological and meteorological data and information, determination of flow duration curves, uncertainty analyses, risk assessment, **Tanzania** (GVEP, 2013)
- Plausibility check of the available hydrological studies for HPP Boshava and Vatashka, Macedonia, studying and plausibility check of available reports and data; hydrologic data evaluation, establishment of mean duration curves and risk assessment, **Republic of Macedonia**, (Hydro Bosava Kavadarci, Republic of Macedonia, 2012)
- Scoping of Opportunities for Integrating Micro-Hydro Turbines (MHP) into existing Irrigation Weirs in the Lower Mekong Basin under the “Support to sustainable hydropower in the Mekong Basin” of GIZ / MRC (Mekong River Commission); evaluation of the potential for integrating MHP schemes into existing irrigation weirs, in combination with measures for improving fish passage, thus improving the multi-purpose use of existing irrigation structures; analysis of hydrology, water availability and generation potential, different MHP technologies, generic potential layouts and designs (at the pre-feasibility level) for these micro hydro applications on existing structures, potential for combined operation with new fish passage facilities, potential for grid-connection or off-grid use (including potential contractual arrangements if applicable), considerations of feed in tariff arrangements, **Laos** (GIZ, 2012)
- Identification mission for the establishment of the Project Document for the PEPP (Programme Eau Potable pour la Population des Grands Lacs, Rwanda, DR Congo, Burundi = Programme for the Drinking Water Supply of the Population in the Region of the Great Lakes); mission to Rwanda, DR Congo and Burundi to get an overview on lessons learned and ongoing projects, to define the project partners, the main stakeholders and to establish the general project approach and the logframe, **Rwanda, DR Congo, Burundi** (SDC, 2012, ongoing)
- Detailed hydrological analysis for the privately financed 10 MW hydropower system Prell, Albania. Assessment and evaluation of the various available hydrological studies, analysis of available hydrological data from 2 gauging stations (establishment of rating curves and flow duration curves), recommendations, risk assessment and calculation of the residual flow as a basis for the planning and detailed design of the hydropower system. The hydropower system Prell will have a nominal capacity of 10 MW and will be financed by private investors at a total project budget of 20 million Euro (30 % Albanian investors and 70 % Hydroplan Green World AS, Norway) with external financing from Norwegian export fund and the Green for Growth Fund GGF Southeast Europe, **Al-**

bania (Hydroplan, GGF, 2012)

- Assistance in preparation and execution of a five-day regional workshop on « small-scale hydropower development in the ECOWAS countries » in Monrovia / Liberia, in cooperation with the ECOWAS Regional Centre for Renewable Energies and Energy Efficiency ECREEE ; review and improvement of the project document for the ECOWAS Up-Scale Programme for small-scale hydropower for the coming 5 years, on the basis of country-specific contributions; identification of national, regional and local stakeholders and analysis of their roles, their activities and capacity building and capacity development needs (including trainings) ; support for the establishment of data base / inventory on SHP resources/projects; evaluation of political, institutional, legal and regulatory, financial and technical frame conditions and preliminary analysis of barriers. The Programme includes: policy and regulatory framework, capacity development, knowledge management and awareness creation, business and investment promotion through support of projects and programmes, **ECOWAS countries** (UNIDO, 2012)
- Study on the available potential of mini and small hydropower in the drinking water supply system of SONEDE /Tunisia ; evaluation of required investments and the economic profitability, proposal of an action plan to make use of the hydropower potential ; assistance to SONEDE to realise a pilot project to test the mini / small hydropower technology ; organisation and implementation of a respective 3-days training session on mini and small hydropower technology for the technicians of the water (SONEDE) and electricity supply (STEG) utilities, **Tunisia** (GIZ, 2012)

May 2003 to Feb 2012

Team member in the “Consulting Department” of ENTEC AG, St. Gallen, Switzerland

Tasks:

- Specialist consulting services in all aspects of rural electrification and renewable energy development in developing countries
- Specialist consulting services in project planning and implementation, management, monitoring and evaluation
- Specialist consulting services in hydropower, water supply and water resources management

Main Activities / Projects :

- Review and commenting of program and project proposals submitted for council approval under the Global Environmental Fund (GEF) Trust Fund; focal area “climate change” under different Work Programs, **Global** (Federal Office for the Environment FOEN / Switzerland, 2005-2008, 2011 ongoing)
- Investment conditions in the hydropower sector in Himachal Pradesh / India; analysis of policies, regulatory framework (national and state level), tax liabilities, incentives and subsidies, allocation of projects, rules, requirements and duties for project developers, general market assessment, scenario analysis for investment and operation costs for 2 case studies (including CDM validation), options for financing and operation models, barrier and risk assessment, **India** (GIZ / international Services IS, 2011)
- Evaluation of the scientific partnership between 2iE and EPFL; Main tasks within this assignment is the in-depth evaluation of a long-standing scientific partnership between the International Institute for Water and Environmental Engineering (2iE) in Ouagadougou / Burkina Faso and EPFL (Ecole Polytechnique Fédérale de Lausanne) in Switzerland with regard to its relevance, efficiency, effectiveness, its impacts and sustainability. Both schools were visited and all kind of relevant stakeholders (staff, students and former students, employers, international organisations, etc.) were interviewed. Main subjects were development of the partnership and of the two schools over the time, recent changes within SDC, in how far does education and (applied) research at 2iE contribute to the development in the region, chances on the employment market, impact of the introduction of the BMD system, gender aspects, quality control system at 2iE, strengthening of academic capacities, activities of other organisations, EPFL's interest in the partnership and finally future perspectives, **Burkina Faso / Switzerland** (SDC, 2011)
- Water supply of medium-sized towns, feasibility study on the application of renewable energies, DR Congo; investigation of potential hydropower sites for the electricity supply of existing water supply systems in 10 towns, assessment of energy demand and potential and of the general feasibility of hydropower systems for the respective locations in the regions Bandundu and Kasai; preliminary design, rough cost estimate and risk analysis, **DR Congo** (KfW, 2010)

- Technical Support Unit TSU, Energising Development II, Indonesia, under the Green PNPM (the World Bank financed national rural empowerment program) TSU assists the realisation of 70 to 100 MHP schemes annually; Mini hydropower (MHP) project preparation support (site identification, feasibility studies, engineering design), implementation of MHP schemes construction supervision, set up of management structures and procedures, promotion of productive use of energy, comprehensive capacity building and development of media (editing and authoring narration for films on productive use of energy and on institutional set-up including financial management and on site identification methods including hydrological aspects), backstopping of comprehensive impact monitoring activities; management of monitoring on “output level” and “outcome level” **Indonesia** (GTZ, co-financed by EnDev / Netherlands, 2009-2012)
- Small Hydropower Promotion Project SHPP, Nepal; continuous backstopping and content-wise input as assistance to the project leader; development of small-scale hydropower (100 kW to 10 MW) through private investors and communities whereby SHPP provides technical, managerial and legal support; assistance and capacity building to AEPC (Alternative Energy Promotion Centre) with regard to projects up to 1 MW, synchronisation of MHPs to the national grid, development of a standard power purchase agreement; **Nepal** (GTZ, 2003-2010); assistance to and coordination support of the DGIS component of the project: establishment of rural electrification entities (REE) who are trained in order to manage their own distribution grid (as part of the national grid); **Nepal** (GTZ, 2009/2010)
- Consulting Services for Evaluation and Business Plan Supervision of Hydropower Plants to be financed by the Raiffeisen Bank Sha, Tirana; comprehensive assessment of the hydrological studies submitted by private investors, evaluation of hydrological data and assessment of risks, **Albania** (Raiffeisen Bank, 2010)
- ASEAN-German Mini Hydro Project AGMHP; contribution of the chapters on management & administration and utilisation of energy to a “picture book on good & bad practices in the mini and micro hydro project sector in Southeast Asia”, **ASEAN countries** (GTZ, 2008)
- Access to Modern Energy Services Ethiopia (AMES-E), Energizing Development EnDev - Partnership between Netherlands Directorate-General for International Cooperation (DGIS) and German Federal Ministry for Economic Cooperation and Development (BMZ); Elaboration of a Baseline Study including stakeholder analysis, present access to electricity, energy policy and legal framework, financial aspects, barrier removal strategy and follow-up recommendations; advisory service on energy policy framework (feed-in law, PPA etc.), **Ethiopia** (GTZ, 2008/2009)
- Elaboration of a study on the establishment of a global support structure for Renewable Energy Technology Exchange RETEX with a specific focus on Mini- and Micro-Hydro Power; demand assessment, prioritisation of products and services to be offered, proposal of a sustainable structure and a detailed implementation plan, **global** (SDC, 2008/2009)
- *Evaluation mission* for the project “Valorisation of natural resources for the improvement of rural living standard - creation of a value added through decentralised energy systems based on *Jatropha curcas*”; assessment of the status quo of the project, the success of its action-research approach compared to similar projects in Mali based on the use of *Jatropha*; evaluation of available technical, economical and institutional data to assess project sustainability and potential for future dissemination of the approach; *planning mission* for the same project: development of a logframe together with the local team in a one-week workshop, **Mali** (SDC, 2005-2008)
- Project Co-director and Hydrologist, for the German-Albanian Financial Cooperation “Renewable Energies and Energy Efficiency Promotion Programme - Promotion of Small Hydropower Plants”; development of a tool to estimate flow duration curves for the sites under investigation based on available data and additional flow measurements; training of local staff to install/operate gauging stations, to realise flow measurements, to establish flow duration curves, to collect and evaluate data; in-depth assessment of hydrological studies for potential sites and recommendations on improvements; evaluation of methods to determine residual flows; determination of minimum duration curves for sensitivity analyses (for bankable documents); presentation on hydrological assessment for a stakeholder workshop, **Albania** (KfW, 2007-2009)
- Social development Specialist, for the Technical Assistance "Community-based Power Supply Project", input to maximize community participation; identifying viable community-based organizations and project stakeholders; determination of willingness to pay, current monthly household energy expenditure, demand and load forecast; participatory development of a legal structure and institutional set-up for sustainable operation & management including task descriptions and qualification of O&M staff, appropriate tariff structure; support of the transfer of ownership process;

awareness raising on energy saving and efficiency; capacity building of local experts; **Tajikistan** (ADB, 2006-2009)

- On behalf of Swiss Development Cooperation (SDC) preparation of the **InfoResources Focus No 2/06: “Sustainable Energy – Rural Poverty Alleviation”**, **Global** (SDC, 2006)
- Mini Hydro Power Project MHPP Indonesia; elaboration of project planning, monitoring & evaluation documents for the continuation of MHPP (project goal: implementation of ~ 60 sites); planning and follow-up of community based institutional set-ups including operation, management and ownership issues, tariff structure, demand forecast etc.; coordination and implementation of activities on promotion of productive use of energy (technical and institutional requirements) and of electricity supply for social infrastructure; development of information media and standard training packages on the above-mentioned subjects; capacity building of educational institutions, local partners, project developers; implementation of a representative baseline survey and impact monitoring (service quality, use of electricity, quality of life, willingness/ability to pay, energy expenditures, etc.); elaboration of a study on the impact of electrification on women; contribution to the establishment of a comprehensive data base including all relevant monitoring information of implemented sites; **Indonesia** (GTZ, co-financing by Energising Development, Netherlands, 2006-2009)
- Area Team Leader in one of the four areas of the Vietnam-Sweden Rural Energy Programme VSRE; namely Area 4 “Institutional models for community service provision and appropriate regulations and implementation of pilot projects in two provinces”; analysis of different institutional models, operation and ownership models, options for community participation, development of productive end-use; contribution to Area 1 “Strengthening the implementing capacity of renewable energy policies”; development of tools and methods for participatory planning and implementation of micro/mini hydropower systems for rural electrification, assessment of willingness and ability to pay, load forecasting, establishment of institutional set-up for O&M etc., and analysis and recommendations on renewable energy policy issues; **Vietnam** (SIDA / Ministry of Industry Vietnam MoI, 2004-2008)
- Energy Expert, Elaboration of measures to improve energy efficiency and tariff collection rates in the supply area of PamirEnergy, a local utility which is a PPP project of Aga Khan Foundation for Economic Development (AKFED) and IFC; based on consumer surveys analysis of status quo and recommendations on: willingness and ability to pay, tariff system, metering, billing and collection, demand side management, including energy conservation and energy efficiency, marketing and communication, **Tajikistan** (IFC, 2005)
- Hydrologist expert, capacity building on field surveys for hydropower development; training on flow measurements, installation of river gauging stations and hydrological analysis; presentations on hydrological aspects, environmental issues and topographic and geological surveys at the seminar “Hydropower Development in the Caribbean”; contribution to Hydro Power Feasibility Studies for Dominica, GTZ/UNDP/GEF, Caribbean Renewable Energy Development Programme CREDP, **Caribbean** (GTZ, 2005)
- On behalf of Swiss Development Cooperation (SDC) preparation of a presentation for the Minister on Foreign Affairs of Switzerland on the topic “Peace through clean energy instead of war for oil – women’s point of view”, **Global** (SDC, 2004)
- Elaboration of a policy paper on “The Swiss Model: Hydropower as Impetus for Poverty Alleviation”, analysis of the socio-economic development impact of rural electrification based on small-scale hydropower in Switzerland, **Global** (Swiss Department of Environment BUWAL, 2004)
- Preparation of a presentation on a “Critical comparison of selected financing mechanisms in relation to transaction costs and impact” for a Task 9 – Workshop of the Photovoltaic Power Systems Programme of the International Energy Agency, **Global** (2004)
- Evaluation mission for the project “Decentralized Electrification of remote rural areas based on decentralised hybrid systems (hydropower, solar and wind energy), the case of Ouneine Valley”, with regard to institutional set-up, O&M issues, sustainability of the systems, community participation, customer satisfaction and potential for replication, **Morocco** (SDC, 2003/2004)
- On behalf of Swiss Development Cooperation (SDC) preparation of a presentation on “A new approach for a more efficient development cooperation”, **Global** (SDC 2003)
- Elaboration of a product description on “Small-scale Hydropower for Rural Development” including collection and evaluation of all relevant information, lessons learned, market description etc. on the subject, **Global** (GTZ, 2003)

- Assessment of the current experience with household and village scale hydro projects and proposal of a strategy for hydro projects with capacity smaller than 5 MW within the context of the "Baseline Survey, Monitoring and Evaluation Framework, and Hydro Market Development Strategy", **Ethiopia** (WB, 2003-2004)

**PhD researcher at the Centre for Interdisciplinary Studies of Technology,
Darmstadt University of Technology, Germany**

Oct 1998 – May 2003

Field of activities :

- Management of an interdisciplinary research project in co-operation with Addis Ababa University, Ethiopia: "**An Interdisciplinary Approach to the Dissemination of Mini and Micro Hydropower - the Case of Ethiopia**"; PhD advisors Prof. Dr.-Ing. Ostrowski (Institute for Hydraulics and Water Resources Engineering, Section for Hydrology and Water Management) and Prof. Dr. rer. pol. Ipsen (Institute for Economics, Political Economy)
publication see: <http://elib.tu-darmstadt.de/diss/000358/>
- Research on aspects related to the dissemination of mini/micro hydropower technology in Ethiopia and their inter-linkage: legal and political aspects, investment and operating costs, profitability, participatory financing mechanisms, project participants / stakeholder analysis, organization forms, community participation, consumption patterns, tariff systems, demand side management, load forecast, etc.
- supervision of student research projects and diploma theses of German and Ethiopian students of civil engineering and economics departments
- project coordination at Darmstadt University of Technology and Addis Ababa University; management of project funds
- organisation of a "Mini and Micro Hydropower Stakeholder Workshop" in Addis Ababa
- management and organisation of the interdisciplinary study focus "**technology and development cooperation**" (lectures on e.g. "**Participatory approaches in development cooperation**")
- elaboration of scientific proposal ("Global Change" programme)

UBP - Umweltschutz - Consulting GmbH, Wiesloch, Germany

Apr – Aug 1998

Tasks:

Collaboration in projects on soil and groundwater protection and decontamination of industrial and other sites

Main Activities / Projects :

- management and co-ordination of projects at different soil and groundwater decontamination sites, such as printing machine production, petrol and service stations, garages, market-gardens etc.
- elaboration of bid proposals, project reports and press releases
- field work: sample drawing, assistance at drilling works etc.
- data processing, interpretation and evaluation
- drafting of expert's reports and assessments; invoice verification

BELLER CONSULT, Freiburg i.B., Germany

Sept 1997 – Jan 1998

Tasks :

Team member in the hydraulic and environmental engineering department

Main Activities / Projects :

- Design of the drainage system for rain water of the "solar settlement Schlierberg / Freiburg", preparation of tender documents, **Germany**
- Concept for a sustainable infrastructure system in "Shanghai Model Town - Yangpu Dinghai" (120.000 inhabitants); assessment of available water resources and water demand (river water, rain water and treated waste water); drafting of an ecological approach for drinking water supply: improvement of the treatment process, recycling of treatment sludge, water storage and distribu-

tion, water saving measures; investment cost estimation for the proposed measures, **China**

- Service Station and Roadhouse Hegau-West; structural design: bill of quantities and costing for sewer system and seepage basins, **Germany**
- City of Villingen-Schwenningen sewer and channel cadastral: catchment basin of Seestrasse, Schwenningen: identification and data input of special structures (storage chambers, weirs, pumping chambers etc.) into the software HYSTEM-EXTRAN 5.1 for sewage systems, **Germany**

IGIP, Consulting Engineers, Ingenieurgesellschaft für internationale Planungsaufgaben mbH Darmstadt, Germany Sept 1992 – June 1997

Tasks :

Water resources management (water supply and distribution, solar pumping systems, drainage planning), environmental management and resources management, hydrology, hydrogeology

Main Activities / Projects :

Burkina Faso (1997)

- Preparation of the tender documents for a water supply project of the town of Bobo Dioulasso
- Hydrological, ecological and economic studies within the scope of a pre-feasibility study for the water supply of the town Fada N'Gourma (28,000 inhabitants)
 - comparison of different solutions: groundwater or surface water (exploitation of an existing or a drinking water reservoir to be build)
 - hydrological studies; determination of the effective/usable water volume with regard to precipitation, runoff, infiltration, evaporation and silting-up of the lake
 - design of spill ways
 - environmental impact study
 - comparative economic calculations

Financing: KfW

Mali (1996)

- Detailed study of the water supply of 9 centres in the first region (Kayes)
 - detailed study, preparation of tender documents, cost estimate

Financing: KfW

Mali (1995)

- Water supply systems of 11 semi-urban and rural centres in the first region (Kayes)
 - selection and design of the appropriate energy supply system (systems with generators, photovoltaic systems and mixed systems), evaluation of pumping tests, hydraulic calculations
 - design of the photovoltaic systems with the DASTPVPS software
 - calculation of investment costs, operating costs, establishment of water tariffs

Financing: KfW

Chad (1995)

- Water supply system of N'Djamena; extension of the system and drilling of 5 new wells
 - elaboration of a mathematical model of the system using the PICCOLO software
 - detailed study on approx. 40 km of additional pipes, optimisation with the PICCOLO software
 - training of the administration's staff on the mathematical model

Financing: EIB

Cameroon (1994)

- Water supply of Bafoussam, Bandjoun, Baham and Bamendjou
 - design of the Bamendjou water supply system (16,000 inhabitants, 17 km of pipes, average supply of 480 m³/day); application of the KYPIPE software, design of distributors

Financing: KfW

Benin (1994)

- Planning of the highway Cotonou - Porto Novo
 - detailed study of the road drainage system; dimensional design of the gutters and infiltration surfaces

- bill of quantities and cost estimation, preparation of tender documents
- Financing: KfW

Togo (1994)

- Water supply of Sokodé: Installation of a hydrological measuring system for the determination of precipitation, potential evaporation and run-off as a basis for the dimensional design of a drinking water reservoir and its spill-way
 - planning, installation and control of the hydrological monitoring network
 - training of local surveying staff
 - implementation of run-off measurements
 - evaluation of the collected data

Financing: KfW

Germany (1993)

- design of a rain retention reservoir in Mainz-Hechtsheim
 - application of a precipitation-runoff model for the dimensioning of a rain retention reservoir with regard to different planning options
 - analysis and evaluation of hydrological data (precipitation, infiltration etc.) and elaboration of the data basis for the dimensioning
 - re-evaluation of the actual volume and forecast of the volume required in the future

Financing: Town of Mainz

Benin (1993)

- Water supply for 14 rural centres
 - baseline survey (identification of basic data)
 - elaboration of a feasibility study
 - design of the systems

Financing: KfW

- Road construction works for the Cotonou - Porto Novo road, hydrological study and elaboration of a road drainage scheme:
 - baseline survey (description and analysis of the actual geographical environment, i.e. relief, vegetation, urbanisation, climate, hydrology, geology, soils)
 - determination of the catchment areas as well as the run-off and infiltration rates
 - elaboration of a road drainage scheme (partial integration into the city's drainage system within the scope of the master plan)

Financing: KfW

Togo (1993)

- Water supply of Tchamba
 - evaluation of hydrological and hydrogeological measurements for a detailed study on the natural groundwater recharge
 - control of the monitoring programme

Financing: KfW

Togo (1992)

- Water supply of Sokodé
 - environmental impact assessment study for the construction of a reservoir providing drinking water for the town of Sokodé
 - survey on climate, hydrology, vegetation, land use, sanitary situation, water-borne diseases and the direct and indirect impacts of the envisaged construction of a barrage
 - elaboration of mitigation measures to avoid negative impacts of the project
 - assessment of the risks of erosion with regard to the silting-up of the lake; proposal of anti-erosive measures

Financing: KfW

Rwanda (1992)

Study for the water supply of 6 rural communities around Kigali; baseline survey: basic data collection (data for spring discharge, water quality, regions to be supplied); Financing: KfW

Other Activities

- Occasional **lecturer** at Zürich University of Applied Sciences, Zürich and University of Freiburg, Germany (“Hydrological aspects in hydropower planning”)
- Participation in a **Training Course on Facilitation**, March 3 to 5, 2014, St. Gallen Switzerland
- Participation in the GTZ training “**Capacity WORKS**, the management model for sustainable development”, April 26 to 28, 2010.
- Participation in a **workshop on impact monitoring** of backstopping mandates, Swiss Development Cooperation, Berne, January 2008
- participation in several **AGUASAN workshops** between 1991 and 2002 on subjects like monitoring and evaluation, communication in development cooperation, water is no longer a free resource: who pays ?, urban Sanitation: a challenge for communities, private sector actors, local governments and external support agencies, transfer of ownership in water & sanitation systems, household-centred approach etc.
- participant of the ASA-Programme (Working and studying visits in Africa, Asia and Latin America) - scholarship of the Carl-Duisberg Association, Berlin / Germany (6/90 - 12/90)
project in East Java/Indonesia:
 - planning and construction of a root purification plant for an environmental education centre as pilot plant and to visualise appropriate technologies
 - preparation of visual aids and teaching materials
- **training on photovoltaic and solar heating systems**, Bund der Energieverbraucher, Germany (2/98 and 3/98)

Publications

- Feibel H., Kessler S. (2016):** “Deploying PV Services for Regional Development, products and future activities of the IEA Working Group”; in: Conference Proceedings of the International Conference on Solar Technologies & Hybrid Mini Grids to Improve Energy Access, OTTI (Hrsg.)
- InfoResources Focus No 2/06 (2006):** “Sustainable Energy – Rural Poverty Alleviation”, compiled by Susanne Wymann von Dach, Hedi Feibel, Andreas Kläy, Fani Kakridi
- Feibel, H. (2003):** *An Interdisciplinary Approach to the Dissemination of Mini and Micro Hydropower – the Case of Ethiopia*, ZIT-Publik 19/2003, ISBN 3-936294-03-8; <http://elib.tu-darmstadt.de/diss/000358/>
- Feibel, H. (2002):** *Energie als Grundbedürfnis - Energie und Globalisierung*; Perspektiven Interdisziplinärer Technikforschung; Konzepte, Analysen, Erfahrungen; Krebs, Gehrlein, Pfeiffer, Schmidt (Hrsg.), Darmstädter Interdisziplinäre Beiträge Nr.6 (2002), S.167-176
- Feibel, H., Collin, A., Scholand, M. (2001):** *Innovative Financing and Organisation of Mini and Micro Hydropower Projects in Ethiopia*; The International Journal on Hydropower & Dams, Volume 8, Issue 3, p.105-107
- Scholand, M., Feibel, H., Collin, A. (2001):** *Finanzierungsformen für Kleinwasserkraft in Schwellen- und Entwicklungsländern*; Elektrizitätswirtschaft, Jahrgang 100 (2001), Heft 25, S.40-45
- Workshop-Proceedings (3rd March 2000)** "Seminar with speeches and group work on Micro and Mini Hydropower in Ethiopia: Hindrances and Possibilities", Addis Ababa University, Faculty of Technology, unpublished
- Feibel, H. (1999):** *Policy change in Ethiopia offers opportunities for small hydropower*; The International Journal on Hydropower & Dams, Volume 6, Issue 5, p.104-105