

Executive Summary

Indian Council of Forestry Research and Education (ICFRE) is a premier organization engaged in the holistic development of forestry research, education and extension in the country. The Council, through its 8 institutes and 4 advance research centres, undertakes research programmes to meet objectives of national forest policy on the one hand and to contribute significantly in enhancement of livelihood of the rural folk on the other with clear perspective in addressing the problems in relation with food and water security of the nation. The Council publishes account of its activities in the form of Annual Report every year. A brief summary of the ICFRE Annual Report 2011-12 is as follows:

Ecosystem Conservation and Management

- Carried out studies on forest soils under natural forests/ plantations and prepared forest soil organic carbon inventory.
- Assessed vegetation carbon pool in 21 forest sites and 30 TOF (Trees Outside Forests) areas of Andhra Pradesh.
- Estimated Carbon stock in forests of six districts of Rajasthan which varied from 18.3 tons/ha in Jhalawar to 41.5 tons/ha in Kota in 0-90 cm soil layer.
- Developed technology for restoration of stress sites, landslides and marginal lands.
- Conducted eco-restoration studies in Uranium Mines at Jadugoda, Jharkhand.
- Carried out study on utilization of fungi for bio-treatment of industrial wastewaters.

FRI, Dehradun prepared Deodar and Kail maps of Uttarakhand, after due verification by ground truthing and also studied the role of Temple Forests in rejuvenating *microclimate of some villages of Uttarakhand*.

RFRI, Jorhat prepared invasion map of *Mimosa* in Kaziranga National park by developing a model integrating remote sensing, Global positioning System and GIS data/ information through Analytical Hierarchy Process (AHP).

- For air quality assessment, established an Air Pollution Bio-monitoring Station at Dehradun.
- Developed a Remote Sensing based Bio-climatic Index.
- Conducted ecological Impact Assessment of invasion of *Lantana*, its removal and subsequent restoration of habitats in Rajaji National Park of tropical moist deciduous forest.
- Studied *Ex-situ* conservation methods of *Vanda coerulea* and *Renanthera imschootiana* and carried out their multiplication.
- Studied socio-economic prospects of *Gnetum gnemon*, an endemic gymnosperm and that of *Livistona jenkinsia*, an indigenous and threatened palm.
- Isolated different strains of *Acoulospora* sp., *Glomus* sp. and *Gigaspora* sp. (VAM) and mass multiplied them through trap culture and pot/plot culture.
- Documented diversity of mycorrhizal associations with *Dipterocarpus* and *Shorea* species in Assam.
- HFRI, Shimla carried out phyto-sociological studies in the Kalatop Khajjiar Wildlife Sanctuary for devising suitable management strategies. 232 plant species, belonging to 76 families and 218 genera, were recorded in the sanctuary. Out of 100 plants species of medicinal importance, found 7 were found threatened.
- AFRI, Jodhpur established plantation trials on highly saline black, silty, clay soil of Little Rann of Kuchh. *Salvadora persica* proved to be the best in terms of survival rate (83.7%) and growth, followed by *Acacia ampliceps*. In rehabilitation of salt affected area, fertilizer treatments significantly influenced the fruit yields of *Salvadora persica* and *A. ampliceps*.

Forest Productivity

- Carried out programmes for developing cultivation protocols for enhancing productivity of some important medicinal plants with *Melia composita*



and *Emblica officinalis* and improvement of degraded land in Punjab and Uttarakhand.

- Studied the impact of ban on green felling in Deodar, Kail, Fir and Spruce forests of Uttarakhand.
- Silviculture studies were conducted on *Hippophae salicifolia* – A Lesser Known Wonder Plant of Uttarakhand.

Microwave irradiation reduces the time of oil extraction from the *Pongamia pinnata* seeds significantly.

0.5% sodium hydroxide and 1.0% potassium hydroxide catalyst concentration are optimum for production of standard biodiesel from *P. pinnata* oil under microwave irradiated conditions.

- Agroforestry and value addition was started to enhance productivity in abandoned jhum land. Rehabilitation of jhum land was also carried out through potential bamboo species with reference to carbon sequestration and livelihood development.
- Carried out comparative studies on optimum treatment time and durability in commercially important bamboo species (*B. pallida* and *D. hamiltonii*) and developed a viable technique for efficient charcoal production from different bamboo species of North East Region.
- In Bilara near Jodhpur, *Prosopis cineraria* was found best on the basis of survival rate and dry biomass with agriculture crops.
- On sandy hill pediment land, *Cordia graf* and *Cenchrus ciliaris* based silvipastoral system produced maximum biomass, followed by *Zizyphus mauritiana* with *C. ciliaris* at 38 months age at Bhuj in Gujarat.
- Refinement has been made to estimate oil content in standing tree by measuring colour intensity using portable colorimeter

Genetic Improvement

- Initiated a programme for improvement of *Eucalyptus*, *Dalbergia sissoo*, *Melia composita*,

Pongamia pinnata and some medicinal plants like *Asparagus racemosus*, and *Acorus calamus*.

- Using microsatellite (SSR) DNA markers 21 large contiguous deodar forests from Uttarakhand, Himachal Pradesh and Jammu & Kashmir were investigated for genetic diversity.
- In the process of developing DNA marker technique in *Cedrus deodara* for timber forensics, success has been achieved in isolating DNA from the dead wood of *C. deodara*.
- Two progeny trials of Red sanders have been established at Hyderabad and Bangalore. Evaluation of early growth performance of these progenies showed the superiority of CPT's collected from Karnataka especially at Kushalnagar, Kodagu.

One clone of *Eucalyptus* hybrid (*Eucalyptus camaldulensis* Dehn. X *E. tereticornis* Sm.) and One productive and wilt disease resistant clone of *Dalbergia sissoo* have been identified and recommended by the Regional Variety Testing Committee for release.

Identified a high oil yielding germplasm (with > 40.0% oil) of *Pongamia pinnata* which is now being evaluated under different site conditions.

- Established a vegetative multiplication garden (VMG) of *Ailanthus excelsa* in 0.5 ha area and created research infrastructure.
- Standardized shoot multiplication medium for *Dalbergia latifolia* and *Pterocarpus santalinus*.
- Selected two clonal seed orchards, one each in Karnataka (Janganamatti, Dharwad) and Andhra Pradesh (Achuthapuram, Rajamundry) to standardize flower induction schedule in clonal seed orchards of *Tectona grandis*.
- Fifteen new candidate plus trees of *Tectona grandis* were selected from different locations of Gujarat and Rajasthan. Genetic analysis of teak half sib progenies was carried out in Rajasthan for the first time.



IFGTB Coimbatore was nominated as the Local Focal Point by Food and Agriculture Organisation (FAO), for preparation of State of the World – Forest Genetics Resources – Country Report for India (SOW-FGR).

Expertise at IFGTB is recognized world over as a partner of multinational network for transcriptome sequencing for salt tolerance in *Casuarina* and *Frankia* of Joint Genome Institute, US, along with UCAD, Senegal; IRD, France and the University of New Hampshire, US.

- Selected 21 CPTs of *Prosopis cineraria* from different intensity of mortality areas in Rajasthan and carried out genetic variation and inheritance of pod characteristics which was not known earlier.
- Based on growth (height & girth) three clones, each of *Eucalyptus camaldulensis* and *Dalbergia sissoo* were selected in multilocation clonal trials in Gujarat. Progeny trial of 17 CPTs having high aza content (>5000 ppm) and oil (>40%) revealed that progenies of the CPT 4 & 7 were better on the basis of growth parameters as well as frost tolerance.
- In demonstration trial of male and female plants of *Ailanthus excelsa*, female plants exhibited superiority in terms of overall growth as compared to male plants at 3 year age.
- Based on clonal trial of *Commiphora wightii*, two clones were identified for highest biomass.
- Developed two seed yield equations in *Jatropha curcas*. In multilocal trial across the country, 14 superior accessions of *J. curcas* were identified.
- Protocols for the seed germination and vegetative propagation using micro cuttings (2.5 mm) of *C. wightii* were developed.
- Identified superior genetic stock of *Picrorhiza kurroa* and *Valarina jatamansi* from different geographical locations of Himachal Pradesh and Uttarakhand.

- Carried out investigations in reproductive biology of *Aquilaria malaccensis* Lamk., a critically endangered and economically important species, for its conservation. A germplasm bank consisting of 50 progenies of *A. malaccensis* was established in RFRI campus and DNA from selected trees was screened, using various primers.
- Artificial inoculations of fungi were done for inducing agarwood in healthy trees within a relatively shorter period.

Using gene expression omnibus in combination with PLEX database, one putative gene having role in salinity stress tolerance was identified.

DNA marker studies on genetic fidelity of micropropagated plants of *Commiphora wightii* revealed genetic uniformity in the plants; hence protocol developed can be used for large scale cloning.

Forest Management

- Consultancy was given to Archaeological Survey of India for conservation of trees at *Ta Prohm* temple at Cambodia as well as to Bodhgaya Temple Management Committee, Bodhgaya, Bihar for the maintenance of *Bodhi-vriksha*.
- Designed and developed web database for timber of commercial importance in Southern India. System Analysis for the sandal web database was completed.

Studies conducted by IWST, Bangalore challenged the current theories for regulating Discrete Generation Cycles which are based on occurrence of natural enemies (as external factors) or cannibalism (as internal factors) and led to preparation of models showing a distinct possibility of factors like protandry for causing discrete generations of the forest pests.

- Conducted extensive surveys for identifying the natural population of *Abies spectabilis* in five Forest Divisions of Himachal Pradesh. Identified nine natural populations of *A. spectabilis*.
- Due to ecological and socio-economic significance of hill bamboos (*Arundinaria falcata* and *Thamnocalamus spathiflorus*), multi-locational



trials of all 22 identified clones of the two species were accomplished at two different locations in the forest areas in Kullu Forest Division and Kotgarh Forest Division.

- Preliminary growth data indicated that *Gmelina arborea* performed well on all the study sites and has attained an average height of about 250 cms within three years of its establishment. Though very early to predict, yet, it can be a potential species for carrying out future plantations in the lower hills.
- Analysed eleven populations of shisham for genetic variation and observed that populations from Jammu & Kashmir (J&K) and Himachal Pradesh (HP) had more genetic diversity as compared to Uttarakhand. Owing to the biotic pressure and local people enjoying the rights of seed collection, the regeneration of Chilgoza pine populations has been found to be very negligible in Kinnaur and Bharmour areas of HP.

Wood Products

- Studied the drying behaviour of chir pine and shisham wood in a self designed convection heating vacuum kiln.
- 22 species with origin from different countries were evaluated for natural durability in Dehradun test yard. After 36 months, all samples were found badly decayed except teak of Myanmar, Ghana and Tanzania.
- Performance of *Pinus roxberghii*, *Pinus radiata*, *Pseudotsuga menziesii* in prototype cooling tower with CCA, CCB and ZiBOC preservative

Treatment methodology for Douglas fir with ZiBOC was developed. Complete protection of Meranti (Red, Yellow and White) and Douglas fir in yard test was achieved after treatment with ZiBOC, CCA and CCB after 20 months of installation.

IWST, Bangalore improved dimensional stability and colour of wood samples of *Acacia auriculiformis* and *Hevea brasiliensis* with thermal modification making them more suitable for flooring.

revealed that *Pinus radiata* performed badly as compared to other species.

- Developed a solvent free process for chemical modification of wood by acetic anhydride and butyric anhydride with iodine as catalyst. This finding has commercial implications as reduction in treatment time will bring down the cost of modified wood.
- Jute and wheat husk were explored as a reinforcing materials for bio-fiber filled polypropylene composites. Jute filled composites exhibited superior mechanical properties to wheat husk filled composites.

Non Wood Forest Products

- Screened 25 prospective plant species for extraction of dye for application on human hair and conducted studies for the development of eco friendly PPD free natural hair colourants.
- New forest based raw materials viz., *Sesbania grandiflora*, *Gmelina arborea* and *Prosopis juliflora* responded well for their suitability for paper making characteristics.
- High xylanase content was observed during Bio-deinking in the crude enzyme preparation of *Coprinus disseminatus* which would be beneficial in enzymatic deinking as it increases brightness of hand sheets against conventional deinking process.
- Testing of *Garcinia* fruit rind (methanol and benzene-alcohol extracts) for acute and chronic effects was completed. The results indicated reduction of 60 % blood sugar after sub-acute observation (blood sample analysis for 14 days). In chronic studies, the blood sugar level was reduced to about 49% (i.e. 21 days after administration of extracts).
- Lac host species viz. *Flemingia macrophylla* and *Flemingia semialata* were transplanted for the establishment of lac based silvi-agri-lac system in the tropical region of Jabalpur. *F. macrophylla* species performed better as compared to *F. semialata*.



- Plantations of *Phyllanthus emblica* cv. NA7 and NA10 performed excellently during the 1st year of plantation. Both cultivars needed additional inputs including timely irrigation and proper doses of fertilizer for establishment.

FRI, Dehradun successfully attempted preparation of handmade paper from noxious weed *Lantana camara*.

Developed Natural dyes and their different shades which are capable of dyeing different type of textiles (silk, wool and cotton).

Also developed a simple and facile process to isolate Hederagenin, a potential bioactive compound known for its anticancer, anti-inflammatory, anti-depressant, anti-hyperlipidemic, anti-tyrosinase, skin lightening and cure of nephritis properties and in prevention and treatment of bone diseases along with a number of other biological activities, from seed kernel extract of *Sapindus mukorossii*

A novel green product named as 'Samridhhi', a silk productivity enhancer for sericulture industry, has been developed from the weeds and tested at Regional Sericulture Research Station, Sahaspur on Silkworm, *Bombyx mori* L. The product is capable of exceptionally reducing the complete spinning time from 32-36 to 15-18 hours.

- Raised seedlings of *Psidium guajava* and *Pterocarpus marsupium* intercropped with *C. cajan* for the development of silvi-horti-agri system. *P. marsupium* exhibited 50% survival and performed poorly in the lateritic soil.
- Developed technology for formulation of three value added food products viz. Mahua jam, squash and chutneys from dried *Madhuca indica* (Mahua) flowers. All the products developed were according to the Food Products Order (FPO) specifications.

Forest Protection

- Artificial cultivation of *Ganoderma lucidum* was achieved by using poplar wood billets. Diversity in

Ganoderma lucidum was studied with special emphasis on its medicinal uses.

- Documentation of macrofungi in rain forests of Makutta was done based on its prevalence during monsoon, pre and post monsoon. During the study, 30 species of macrofungi were identified. A manual for field identification of macrofungi is also under preparation.

A molecular diagnostic kit for *Cordyceps sinensis* & *Ganoderma lucidum* identification was developed.

- Durability of plantation timbers of various ages against bio-deteriorating agents was tested. Wood of *Acacia auriculiformis* and *A. mangium* even at five years of age can be used for different purpose as they showed considerably good resistance against decay fungi, whereas, even 20 year old *Ailanthus excelsa* and *A. malabaricum* were found nondurable.
- Studies have been initiated on insect mediated pollination biology of mangrove plants in Sonneratiaceae and Aviceniaceae in coastal Karnataka and on diversity of whiteflies (Aleyrodidae: Homoptera) and their natural enemies in Mangrove habitats of India.
- Conducted studies on biodiversity of parasitic *Chalcidoidea* (Hymenoptera) of Uttarakhand. Carried out taxonomic studies on parasitoids belonging to subfamily *Microgastrinae* (Hymenoptera: Braconidae) of Uttarakhand and Haryana.
- Studied bio-ecology and management of oak stem borer, *Aphrodisium hardwickianum* White (Coleoptera: Cerambycidae).
- Isolated and characterized phytoecdysteroids from *Achyranthes aspera* and *Achyranthes bidentata*. Also studied their effects on economic traits of silkworm *Bombyx mori* L.
- Detailed bio-ecology of the white grub complex was investigated in Maharashtra, based on which



the model for the integrated management was proposed to Forest Development Corporation, Maharashtra.

Artificial diet for conservation and utilization of preying mantis as biocontrol agents was developed.

Three new species of white grubs (*Holotrichia rustica*, *H. mucida* and *Schizonchya ruficollis*) were identified for the first time. These grubs caused vast scale damage to teak seedlings in forest nurseries

- Aonla cv. NA-10 was found to be relatively resistant followed by Kanchan against gall forming insect *Betousa stylophora*, defoliator *Garcillaria acidula* and bark eating caterpillar *Indarbela quadrinotata*. In nursery, foliar spray of monocrotophos 36 E.C. 0.05% followed by metasystox 25 E.C. 0.05% and soil application of phorate 10G and furadon 4G each @ 25g/1mx1m plot were also found to be equally effective against *Betousa stylophora*.
- Blue gum chalcid wasp, *Leptocybe invasa*, was found to be a major threat to *Eucalyptus* in nurseries of central India.
- Seven entomopathogenic nematode strains native to central India were isolated. One of them was identified for the first time, as an important biological control agent against major forest insect pests.
- From different conifer bearing sites, 2740 and 1360 specimens of moths were collected during 2010 and 2011, respectively. 69 species of moths were dissected so as to study wing venation and genitalia for taxonomic updates.
- New mite species have been found infesting the stored seeds. The different treatments applied and analyzed for developing suitable control measures to protect the stored Chilgoza seeds for longer period.

Release of indigenous strain of eggs parasitoid, *Trichogramma raoi* @ 1.25 lakh/ha was found to be effective in minimizing damage impact caused by teak defoliator and leaf skeletonizer.

Twenty five species of *Apanteles*, promising biological control agents of key defoliators of teak and sal forests, were recorded for the first time from Odisha.

Forestry Education

- ICFRE provided scores of trainings regularly, a few important include, a three day training programme on “CDM Validation and Verification” with the help of M/S TUV SUD SOUTH ASIA Pvt. Ltd., New Delhi; ICFRE-IDS collaborative workshop on “Strengthening Knowledge Sharing for Effective Development in Uttarakhand”; one week compulsory training course for Indian Forest Service Officers on “Forest and Climate Change: Opportunities and Challenges of Mitigation and Adaptation”; one week DST training programme on “Climate Change and Carbon Mitigation” for scientists and technologists; Convention on Biological Diversity (CBD) Expert Group Meeting on “Biodiversity for Poverty Eradication and Development”; one week training programme on “Climate Change and Carbon Mitigation” for women scientists and technologists; two-day training workshop for Indian Forest Service officers on “Significance and Scope of REDD/REDD+ for Indian forest”. The officers and scientists from ICFRE also participated in various international meetings including 14th session of the Ad-hoc Working Group on Long-Term Cooperative Action (AWG-LCA) under the United Nations Framework Convention on Climate Change; 16th session of the Ad-Hoc Working Group on Future Commitments for Parties under the Kyoto Protocol (AWG-KP) at Bangkok, Thailand; UN Climate Change Conference at Bonn, Germany; UNFCCC COP 17 and COP/MOP-7 at Durban, South Africa.



ICFRE is providing Grants-in- Aid to various universities and institutions imparting Forestry Education in the country. ICFRE released Grants-in Aid of Rs.100 Lakh to 10 universities during the year under report. Besides, ICFRE has been actively involved in the Mid Career Training Programme of IFS Officers (Phase-III).

Forestry Extension

- ICFRE conducted and participated in a number of seminars, workshops, fairs etc. for the benefit of farmers, tree growers, and other stakeholders; publication and dissemination of technologies through VVKs and DVs.
- 4 **Tree Growers Mela** was held at IFGTB, Coimbatore on 23-24 February 2012. It was inaugurated by Smt. Jayanthi Natarajan, Hon'ble Minister of State (Independent Charge), Ministry of Environment and Forests, Government of India.
- ICFRE organized First ever **Indian Forestry Congress (IFC)** in New Delhi from 22 to 25 November 2011. New Delhi Forest Charter 2011 was adopted at the Congress which was attended by 550 participants from over 50 organizations. The congress was inaugurated by Smt. Jayanthi Natarajan, Hon'ble Minister of State (Independent charge), Ministry of Environment and Forests, Government of India.
- The Council organized trainings on various topics including "Urban Plantation: Choice of tree species, Techniques & Specification", "Nursery and Plantation Technique of Medicinal Plants & Utilization", "Nursery and Plantation Techniques of Fast Growing Tree Species", "Micro and Macro propagation Techniques for Quality Planting Stock Production", "Sustainable Management, Product Diversification and Value Addition of Bamboo and Wildlife Management" and "Sustainable Utilization, Conservation and Cultivation of Medicinal Plants" through its network of Van

Vigyan Kendras and Demo Villages throughout the length and breadth of the Country.

- ICFRE is regularly publishing books, newsletters, bulletins, booklets, brochures, and pamphlets besides numbers of research papers in various Indian and foreign journals. An outstanding book on the achievements in the field of forestry research in the country spread over a century, "**Forestry in the Service of the Nation: ICFRE Technologies**" was published along with other important publications including "**Voices From the Field**". ICFRE compiled a report on the occasion of celebration of the International Day for Biological Diversity (IBD) on 22 May 2011 and submitted it to the Ministry of Environment and Forests.
- During 2011-12, under the Integrated Community Based Forest Management Project in Bihar {Samudai Adharit Samanvit Van Prabandhan Evam Sanrakhshan Yojna (SASVPESY)} commonly known as Bihar Project, 3.87 Lakh ETPs were planted at farmers field, while 1.68 Lakh ETPs were used for raising the nurseries and a total of 7.12 lakh seedlings/plants of various tree species like poplar, teak, mahogany, gamhar, semal, kadam, jamun, bamboo etc. were distributed to farmers from model nurseries.

Consultancies were undertaken in the areas of hydropower, mining, infrastructure etc.

ICFRE on the directions of Honorable Supreme Court of India conducted Macro level EIA for Mine affected districts of Karnataka. The recommendations made were implemented *in toto* by the Hon'ble Supreme Court of India.

Government of Karnataka has awarded the preparation of Reclamation and Rehabilitation Plan for the mine affected districts of Bellary, Chitradurga and Tumkur to the Council.



- During the year under report, 125 new projects were initiated including 28 externally aided projects, whereas, 120 projects were completed including 31 externally aided projects.

New Initiatives

An assembly of new innovative ideas has initiated reshaping of forestry research and extension in the country with a people-centric approach.

The Research Thrust Areas of ICFRE have been revised with a focus on the enhancement in livelihood of the rural and tribal people and on the food and water security, and six thrust areas and 35 themes have been identified.

The Thrust Areas are:

- i) Managing forests and forest products for livelihood support and economic growth,
- ii) Biodiversity conservation and ecological security,
- iii) Forests and climate change,
- iv) Forest genetic resource management and tree improvement,
- v) Forestry Education and Policy Research to meet emerging challenges, and
- vi) Forestry Extension for taking research to people.

Networking of VVKs with KVKs of ICAR has been initiated with a view to provide better outreach to the ICFRE technologies and processes.

International cooperation was initiated with a number of organizations including ICMOD, JICA, UK Forestry Commission, Chinese Academy of Forestry etc.

The composition of **Forest Types of India** in the field have changed a lot since last revision in 1969. Their revision was long overdue. ICFRE constituted a task force to prepare a change matrix of forest vegetation in the country which is going to be completed by December 2012. This will act as a baseline for monitoring climatic changes in the forests of the country.

Creation of Ginger Group/ Knowledge Pool – Consultative groups of ICFRE scientists and other eminent forests officers to think beyond the traditional concept of stakeholder / demand driven / need driven research concepts has been created to bring 'innovative ideas and out of box thinking' for solving the problems of Consumers on the issues relating to emerging challenges of forestry science.

National Subject Matter Coordinators (NSMCs) have been nominated to develop systematic approach on various subject matters and to develop site specific and subject specific research programmes. They are expected to coordinate research, extension and marketing activities in identified themes. National subjected matter experts have been designated in 35 thematic areas.

National Project Directors (NPDs) nominated in six thrust areas to develop All India Coordinated Projects on the Thrust Areas and prepare a road map to undertake research in program mode.

To enhance the outreach of research findings in the field the **“Direct to consumers”** scheme for immediate transfer of recently developed technologies to the consumers has been initiated.

A coffee table book, **Biodiversity of India** depicting diverse forest types, biodiversity hotspots, floral and faunal biodiversity, conservation steps etc in the country is conceived for publication and subsequent release in COP -11 meeting at Hyderabad during October 2012.

CONTENTS

<i>Chapter</i>	<i>Page No.</i>
1. Introduction	1-10
2. Research Highlights	11-20
2.1 Ecosystem Conservation and Management	21-52
2.2 Forest Productivity	53-81
2.3 Genetic Improvement	82-107
2.4 Forest Management	108-110
2.5 Wood Products	111-119
2.6 Non Wood Forest Products	120-151
2.7 Forest Protection	152-172
3. Education Vistas	173-188
4. Extension Panorama	189-228
5. Administration and Information Technology	229-238
6. Audited Annual Accounts	239-270
Annexures	271-296
1. Members of Board of Governors	273
2. RTI	274
3. Email & Postal Addresses	277
4. Citizen Charter	280
5. List of Abbreviations	293