

26. März 2019

**Stellungnahme zum
Leibniz-Institut für Gewässerökologie und Binnenfischerei,
Berlin (IGB)**

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Vorbemerkung

Die Einrichtungen der Forschung und der wissenschaftlichen Infrastruktur, die sich in der Leibniz-Gemeinschaft zusammengeschlossen haben, werden von Bund und Ländern wegen ihrer überregionalen Bedeutung und eines gesamtstaatlichen wissenschaftspolitischen Interesses gemeinsam gefördert. Turnusmäßig, spätestens alle sieben Jahre, überprüfen Bund und Länder, ob die Voraussetzungen für die gemeinsame Förderung einer Leibniz-Einrichtung noch erfüllt sind.¹

Die wesentliche Grundlage für die Überprüfung in der Gemeinsamen Wissenschaftskonferenz ist regelmäßig eine unabhängige Evaluierung durch den Senat der Leibniz-Gemeinschaft. Die Stellungnahmen des Senats bereitet der Senatsausschuss Evaluierung vor. Für die Bewertung einer Einrichtung setzt der Ausschuss Bewertungsgruppen mit unabhängigen, fachlich einschlägigen Sachverständigen ein.

Vor diesem Hintergrund besuchte eine Bewertungsgruppe am 4. und 5. Juni 2018 das IGB in Berlin. Ihr stand eine vom IGB erstellte Evaluierungsunterlage zur Verfügung. Die wesentlichen Aussagen dieser Unterlage sind in der Darstellung (Anlage A dieser Stellungnahme) zusammengefasst. Die Bewertungsgruppe erstellte im Anschluss an den Besuch den Bewertungsbericht (Anlage B). Das IGB nahm dazu Stellung (Anlage C). Der Senat der Leibniz-Gemeinschaft verabschiedete am 26. März 2019 auf dieser Grundlage die vorliegende Stellungnahme. Der Senat dankt den Mitgliedern der Bewertungsgruppe und des Senatsausschusses Evaluierung für ihre Arbeit.

1. Beurteilung und Empfehlungen

Der Senat schließt sich den Beurteilungen und Empfehlungen der Bewertungsgruppe an. Das Leibniz-Institut für Gewässerökologie und Binnenfischerei (IGB) erforscht grundlegende Prozesse in Gewässerökosystemen. Mit seinem interdisziplinären Ansatz führt es eine beeindruckende Vielfalt an Fachexpertise zusammen, die von der Hydrologie, Limnologie, Molekular- und Mikrobiologie über die Ökologie und Fischereibiologie bis hin zur Umweltfolgenabschätzung reicht. Ziel ist es, Wissen für ein nachhaltiges Gewässermanagement zu erarbeiten und verfügbar zu machen. Die bearbeiteten Themen und Schwerpunkte sind aktuell und auch international von hoher Bedeutung. Dabei gelingt es dem Institut bemerkenswert gut, Forschungsfragen mit Aspekten der Anwendung zu verbinden. Die in sechs Abteilungen durchgeführten Arbeiten werden je zweimal als „sehr gut bis exzellent“, „sehr gut“ und „gut bis sehr gut“ bewertet.

Seit der letzten Evaluierung hat sich das IGB zu einer der führenden europäischen Forschungseinrichtungen für Binnengewässer entwickelt. In seiner **Forschung** hat das Institut die theoretische Fundierung empfehlungsgemäß gestärkt und seine Publikationsleistung deutlich gesteigert. Auch wurde die abteilungsübergreifende Zusammenarbeit weiter intensiviert, was sich in einer hohen Anzahl gemeinsam erarbeiteter Publikationen widerspiegelt. Die vom IGB eingeworbenen **Drittmittel** haben sich seit der letzten Evaluierung sehr positiv entwickelt. Das Institut erzielt mittlerweile ein Drittel seiner Erträge

¹ Ausführungsvereinbarung zum GWK-Abkommen über die gemeinsame Förderung der Mitgliedseinrichtungen der Wissenschaftsgemeinschaft Gottfried Wilhelm Leibniz e. V.

bei Dritten, darunter umfangreiche Förderungen von EU, DFG sowie im Wettbewerbsverfahren der Leibniz-Gemeinschaft. Besonders hervorzuheben sind drei ERC-Grants, die seit 2012 von Mitarbeiterinnen und Mitarbeitern des Instituts eingeworben wurden.

Das IGB verfügt über exzellente **Forschungsinfrastrukturen**. Insbesondere mit dem Seelabor am Standort Stechlinsee steht eine bedeutende Versuchsanlage zur Verfügung, die nach einer mehrjährigen Aufbauphase zukünftig für weitere Kooperationen genutzt werden sollte. Es wird begrüßt, dass das IGB mit AQUACOSM ein Netzwerk führender europäischer Forschungsinfrastrukturen koordiniert. Pläne, dieses Netzwerk in das *European Strategy Forum on Research Infrastructures* (ESFRI) einzubringen, sollten weiterverfolgt werden.

Mit seinen Infrastrukturen erhebt das IGB Forschungsdaten von hoher Relevanz. So fanden etwa die limnologischen Langzeitdaten im 5. Bericht des Weltklimarats Berücksichtigung. Es ist sehr positiv zu bewerten, dass das Datenmanagement weiter professionalisiert wurde und die am Institut erfassten Forschungsdaten inzwischen im Rahmen von internationalen Repositorien nutzbar sind. Das IGB sollte auf diesem strategischen Weg fortschreiten und ein abteilungsübergreifendes Forschungsdatenmanagement aufbauen.

Die Verflechtung von Öffentlichkeitsarbeit mit **Wissens- und Technologietransfer** zu einem sogenannten „Science-Society-Interface“ hat sich bewährt. Mit teilweise neu entwickelten und innovativen Publikations- und Dialogformaten werden Akteure in Politik, Behörden und Verbänden erreicht. Dieser Bereich leistet ausgezeichnete Arbeit und sollte weiter gestärkt werden.

Seit der letzten Evaluierung kam es insbesondere ruhestandsbedingt zu zahlreichen **personellen Wechseln** auf Leitungsebene. Dabei hat das Institut sehr gut agiert und ausgewiesene Wissenschaftlerinnen und Wissenschaftler für die Mitarbeit gewonnen. Seit der hoch anerkannte Direktor des IGB 2016 ausschied, wird das Institut erfolgreich von einem Wissenschaftler geleitet, der gleichzeitig eine Abteilungsleitung innehat. Diese Übergangszeit verlängert sich nun, denn aus Gründen, die das Institut nicht zu verantworten hat, kann die designierte neue Direktorin ihr Amt nicht wie vorgesehen antreten. Die Verantwortlichen müssen nun erreichen, möglichst zügig eine ebenso gute Lösung zu finden.

Die **strategischen Planungen** des IGB zielen auf eine Stärkung ökosystemischer und integrativer Ansätze. Das Institut beabsichtigt, dafür zusätzliche Mittel der institutionellen Förderung im Rahmen eines Sondertatbestands zu beantragen, um ein Isotopenlabor einzurichten und die bestehenden Infrastrukturen für Feldforschung weiterzuentwickeln. Das Konzept ist überzeugend und wird mit Nachdruck befürwortet. Dagegen wird die Beantragung zusätzlicher Mittel für den Aufbau einer molekularen Biodiversitätsanalyse derzeit nicht befürwortet.

Der Senat begrüßt, dass seit der letzten Evaluierung wie empfohlen Maßnahmen zur Verbesserung der räumlichen Ausstattung und zur Modernisierung der IT ergriffen wurden. Es besteht jedoch weiterhin das Problem, dass die finanzielle Ausstattung des Instituts mit der dynamischen Entwicklung des Fachgebiets hin zu einer instrumentenintensiven analytischen Forschung nicht Schritt gehalten hat. Der Senat hatte darauf bereits 2012

hingewiesen. Es sollten nun Lösungen gefunden werden, die zu weiteren Verbesserungen führen.

Es wird begrüßt, dass das IGB sein strukturiertes **Programm für Doktorandinnen und Doktoranden** weiterentwickelte. Die Promovierenden sind in verschiedene Graduiertenschulen der Hauptstadtregion eingebunden. Die Postdoc-Förderung am IGB ist überzeugend strukturiert und sollte um Mentoring-Elemente, die eine frühzeitige Eigenständigkeit fördern, ergänzt werden. Durch aktive Rekrutierungsmaßnahmen erreichte das Institut sichtbare Verbesserungen in der **Gleichstellung der Geschlechter**. Das IGB sollte das Gleichstellungsziel aber auf allen Hierarchiestufen erreichen.

Die **Kooperation** des IGB mit Hochschulen in Berlin und Brandenburg ist vielfältig und intensiv. Von den derzeit zehn gemeinsamen Berufungen erfolgten sechs seit der letzten Evaluierung. Auch darüber hinaus ist das IGB ein äußerst gefragter Kooperationspartner und an einer beachtlichen Anzahl verschiedenartiger Forschungskonsortien, Initiativen und internationaler Verbände beteiligt, teilweise in führender Rolle.

Das IGB widmet sich unter Einbeziehung einer Vielzahl von Fachdisziplinen der Erforschung von Gewässerökosystemen und den darin auftretenden Lebensgemeinschaften. Vor dem Hintergrund der Bedrohung wasserbasierter Ressourcen durch vielfältige Nutzungsansprüche befasst sich das Institut in sehr guter Weise mit Fragestellungen, die weltweit von hoher Bedeutung sind. Dazu betreibt es wichtige Forschungsinfrastrukturen und vermittelt seine Erkenntnisse über die Wissenschaft hinaus hervorragend in die Öffentlichkeit. Die Erfüllung der vom IGB wahrgenommenen Aufgaben ist an einer Hochschule so nicht möglich. Eine Eingliederung des IGB in eine Hochschule wird daher nicht empfohlen. Das IGB erfüllt die Anforderungen, die an eine Einrichtung von überregionaler Bedeutung und gesamtstaatlichem wissenschaftspolitischem Interesse zu stellen sind.

2. Zur Stellungnahme des IGB

Der Senat begrüßt, dass das IGB beabsichtigt, die Empfehlungen und Hinweise aus dem Bewertungsbericht bei seiner weiteren Arbeit zu berücksichtigen.

3. Förderempfehlung

Der Senat der Leibniz-Gemeinschaft empfiehlt Bund und Ländern, das IGB als Einrichtung der Forschung und der wissenschaftlichen Infrastruktur auf der Grundlage der Ausführungsvereinbarung WGL weiter zu fördern.

Annex A: Status report

Leibniz-Institute of Freshwater Ecology and Inland Fisheries, Berlin (IGB)

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1. Structure, tasks and institutional environment

Development and funding

The Leibniz-Institute of Freshwater Ecology and Inland Fisheries (IGB) in the Forschungsverbund Berlin e. V. was founded in 1992 by merging three institutes of the former GDR, two of them affiliated with the Eastern German Academy of Sciences, the third with the Ministry of Agriculture.

Since then, the institute has been jointly funded by the Federation and the German *Länder*. The last evaluation took place in 2011/2012. In May 2012 the Joint Science Conference determined that IGB still meets the requirements for joint funding.

Responsible department at *Länder* level: The Governing Mayor of Berlin (Senate Chancellery, Department IV/Research)

Responsible department at federal level: Federal Ministry of Education and Research

Mission and tasks

IGB is an independent and interdisciplinary research centre dedicated to the generation, dissemination, and application of knowledge about freshwater ecosystems and inland fisheries. IGB's **mission** is to advance the understanding of the structure and functioning of inland waters as a basis for the sustainable management of freshwater ecosystems.

IGB's **overarching goals** are to:

- advance the mechanistic understanding and improve prediction of the structure, long-term dynamics and functioning of freshwater ecosystems and their biodiversity in the light of global environmental change (**science**)
- provide knowledge and develop strategies for the future management of freshwater ecosystems and fish in the wild and in aquaculture systems (**application**)
- train the next generation of scientists capable of analysing freshwater ecosystems and of developing solutions for persisting and future environmental issues (**education**)
- communicate data and knowledge to both the scientific community and society at large, including stakeholders, policy makers and the general public (**information**).

Legal form and organisation

IGB is a registered association (e. V.). Together with seven other Leibniz institutes, IGB constitutes the Forschungsverbund Berlin e. V. (FVB), which acts as the legal entity of its members and provides administrative services to them while the institutes maintain their scientific autonomy.

IGB is jointly led by a **scientific director** and the **managing director of the FVB**. The scientific director is appointed by the Board of Trustees of the FVB on recommendation of IGB's Scientific Advisory Board. Appointments are for five years and renewable. The director develops the scientific work programme and is responsible for its implementation and further development. The managing director of the FVB is tasked with the administrative management of the institute and trustee of its budget (Haushaltsbeauftragte).

The supervisory body of the institute is the **Board of Trustees of the FVB**. It is responsible for the supervision of all essential scientific, political, programme-related and economic issues. Decisions specific to the institute are prepared by a Committee of the Board of Trustees ("**Institute committee**") which consists of a representative each of the Senate Chancellery of Berlin, the Federal Ministry and IGB's Scientific Advisory Board (chair).

The **Scientific Advisory Board** advises the director and the Board of Trustees of the FVB on IGB's scientific programme and development planning. It consists of a minimum of six and a maximum of twelve members. They are appointed by the Board of Trustees of the FVB. The term of office is generally four years; one successive reappointment is admissible.

Research structure

IGB's research is organised in six **departments** (cf. chapter 3) – specified in 39 research groups. To promote interdisciplinary collaboration across departments, IGB has defined three **cross-cutting research domains** (cf. below and organisational chart, appendix 1).

National and international scientific environment

IGB states that many countries invest in freshwater research centres that complement academic research at universities. However, these institutions differ in their mandate, size and focus, because freshwater science is multifaceted, involving a range of disciplines, and many are charged with management and policy responsibilities in addition to research. According to the institute, institutions, or parts thereof, that best match IGB's academic profile are: (1) the Swiss Federal Institute of Aquatic Science and Technology (Eawag), (2) the Alpine Research Centre for Lake Ecosystems and Food Webs (CARRTEL) in France, and (3) the Helmholtz-Centre for Environmental Research (UFZ) in Germany. Further prominent examples are the Canada Centre for Inland Waters (CCIW), the National Institute of Water and Atmospheric Research in New Zealand (NIWA) and the Centre for Ecology and Hydrology (CEH) in the UK.

National interest and justification for funding as a non-university institution

As IGB points out, fresh water is a vital resource that touches on many aspects of life. At the same time, the multifaceted importance of fresh water as a resource and habitat entails numerous threats to human water security and ecosystems, including biodiversity and the services provided to society. IGB aims to address these challenges by bringing together a critical mass of expertise and manpower to conduct integrated, interdisciplinary research.

According to IGB, the rationale for its funding as a non-university institution is based on a) the strategic relevance of freshwater science, b) a critical size required especially in view of the multifaceted nature of freshwater science, c) the need for flexibility, continuity and a long-term perspective, d) the need for large research infrastructure and facilities, as well as e) the need to link fundamental science with applications.

2. General concept and profile

Development of the institution since the last evaluation

Research at IGB continues to focus on fresh water with a particular emphasis on freshwater ecology and inland fisheries. However, there have been **shifts in emphasis** with three of the six department heads and a quarter of the group leaders replaced between 2011 and 2017. The institute states that the recruitment of new scientific staff has strengthened theoretical ecology. Moreover, experimental ecosystem science has been enhanced mainly by large-scale infrastructure in Lake Stechlin, and the appointment of a new department head. Other research areas that have been strengthened since 2011, or are entirely new, include fish behavioural ecology, stream ecology, invasion ecology, and ecohydrology. Moreover, urban ecology, recreational ecology and impacts of novel stressors are emerging as new focal areas, whereas algal and fish systematics as well as lake physics have decreased in importance.

According to IGB, the **cross-cutting research domains** proved particularly important for the development of IGB. Established in 2010 as a strategic initiative to promote interdepartmental collaboration, three broad topics were identified in an iterative top-down and bottom-up process: Aquatic Biodiversity, Aquatic Boundaries and Linkages, and Human-Aquatic Ecosystem Interactions. The aim was to invigorate joint research across at least three departments within a common conceptual framework. Annual discretionary funds were made available. Overall, as the institute points out, the establishment of the cross-cutting research domains has created a strong momentum for interdisciplinary research across all departments.

Furthermore, IGB has invested into **large infrastructures**, such as the IGB LakeLab in Lake Stechlin and a 3D telemetry system at Lake Döllnsee (cf. below, “Infrastructure”). Likewise, long-term research at IGB on Lakes Müggelsee, Stechlin and Arendsee and the River Spree was strengthened by improving sensor networks for continuous high-resolution data records. These investments, as IGB points out, facilitated attracting a high number of researchers in the last few years. Some of the infrastructures have been approved as sites of multiple international networks.

Results

The causes and consequences of environmental change on freshwater ecosystems and biodiversity have continued to be a major focus of IGB's research over the last seven years. The institute has provided insights into how lake, river and wetland biodiversity and ecosystems are organised and function, in addition to providing information and advice on changes and management options in the face of global change. Topics of particular interest were ecosystem regime shifts, night-time light pollution, methane dynamics, wetland restoration, aquatic boundaries, freshwater biodiversity, biological invasions, aquaculture, and the interactions between humans and aquatic environments. Other important topics were matter fluxes at river and catchment scales, the importance of terrestrial organic carbon in aquatic ecosystems as well as genetic, evolutionary and conservation aspects of aquatic populations and communities.

In the years 2015 to 2017, IGB's scientists published a total of 298, 351 and 342 **publications**, the majority of them being articles in peer-reviewed journals (see appendix 2 for further details). As IGB points out, compared to the reference period three years before the last evaluation (2008-2010), this is an increase the publication output from a total of 143 per year to 259 per year (80 %).

According to IGB, the institute has been successful at implementing its **publication concept**, which is aiming for high impact both in the scientific community and on stakeholders and society at large. In particular, there has been an increase in the number of articles published in highly ranked journals of the disciplines represented at the IGB (e.g. *Behavioral Ecology*, *Biogeosciences*, *Environmental Science & Technology*, *Fish & Fisheries*, *Freshwater Biology*, *ISME Journal*, *Journal of Hydrology*, *Limnology & Oceanography*) as well as in general ecological (e.g. *Ecology*, *Ecology Letters*, *Global Change Biology*, *Trends in Ecology & Evolution*) and general-science journals (*Current Biology*, *Nature* and *Science* family journals, *Proceedings of the National Academy of Science of the USA*). IGB states that, in addition, the institute has disseminated its results in publications consulted by practitioners in water and fisheries management. Additional measures to inform stakeholders and the broader public include a newly established series of targeted publications produced in-house (see below).

IGB introduced an **Open Access** strategy in 2017, which includes funds to promote Gold Open Access publications. In the beginning of 2018, Green Open Access was made mandatory for all publications with IGB scientists as lead or senior authors. Currently, open-access publications account for about 25 % of all IGB publications.

IGB provides **scientific and infrastructure services** for the scientific community, authorities and other stakeholders outside science. These are:

- the provision of large research infrastructures to external users, which includes the IGB LakeLab at Lake Stechlin and the Berlin Center for Genomics in Biodiversity Research (BeGenDiv jointly operated by several partners);
- the provision of data from IGB's long-term monitoring programme on Lakes Müggelsee, Stechlin and Arendsee, as well as the River Spree, supported by a new database infrastructure to facilitate data exchange;
- the maintenance, development and application support of models, such as MON-ERIS, a spatially explicit model to describe and assess the hydrologically driven fluxes of nutrients and suspended solids, and the physical lake model FLAKE, which is used, for example, in all major weather forecast systems in Europe;
- the provision of other research products such as the Freshwater Information Platform (FIP), an internet portal dedicated to compiling and disseminating comprehensive information about freshwater science.

IGB's scientists give advice on fish and fisheries management, water management and broader environmental issues to national and regional authorities, members of parliament as well as private and public associations (e.g. angling and fisheries associations, water and soil associations). They also serve as experts for international organisations such as the International Association of Hydrological Sciences, the OECD and others in

their capacity as committee members or reviewers. In order to further embrace its activities, IGB has developed a **knowledge-transfer and communication strategy**. Implemented in 2015, this strategy on IGB's account blends the traditional domains of public relations and knowledge & technology transfer in a single operational unit referred to as the Science-Society Interface (SSI).

As part of this initiative, IGB established the **IGB Outlines** in 2016, a publication series comprising Fact Sheets, Policy Briefs, and Dossiers (e.g. on sulphate pollution of the River Spree) that present scientific knowledge to stakeholders, policy makers and the general public. In the same year, a new stakeholder workshop series entitled **IGB Academy** was introduced to transfer scientific knowledge to practitioners and other professionals outside science. The first two events dealt with Aquaponics (combining techniques of fish breeding and crop cultivation) for Practitioners (2016) and Light Pollution of Ecosystems and Sustainable Lighting Systems (2017). In addition, IGB uses its **Dialogues at Lakes Müggelsee and Stechlin** as a format to formalise a regular exchange with stakeholders and the interested public.

IGB collaborates with small and medium-sized enterprises in **R&D projects**. These activities are supported by IGB's SSI staff through advice on intellectual property management and funding opportunities. A recent example is a project aiming at the establishment of a business on marketing sustainable insect-based fish feed.

Academic events and public relations

IGB scientists regularly organise conferences, symposia and workshops at either IGB or other venues. Altogether, IGB was involved in the organisation of 17 main events, among them several larger international conferences such as the 17th International Conference on Diffuse Pollution and Eutrophication of the International Water Association, the 11th Conference of the Society of Wetland Scientists or the 6th International Multidisciplinary Conference on Hydrology and Ecology.

As part of IGB's SSI initiative, the public relations team is in charge of coordinating all public relations activities. This includes media relations, online communication, the provision of information material as well as the organisation of events and outreach activities. Since 2015, IGB has also been present in the social media. IGB's website was relaunched in 2016. An IGB newsletter will go online in 2018.

Strategic work planning for the next few years

The institute does not expect its overall focus and mission to undergo fundamental shifts in the coming years. There are, however, technological and conceptual advances to be expected especially with respect to the **integration across disciplines and scales**. This primarily concerns:

- (1) integration of **ecohydrology, biogeochemistry and biodiversity science**, applying new technological approaches, particularly stable-isotope analyses, high-throughput molecular approaches (e.g. meta-genomics, transcriptomics, eDNA analyses, meta-barcoding), high-resolution measurements with field sensors, and remote sensing;

- (2) integration of **freshwater ecology with fish and fisheries sciences**, including aquaculture in addition to fish physiology, behaviour, population and community dynamics as well as human intervention with fish stocks;
- (3) integration of IGB's **Science-Society-Interface** (PR and knowledge transfer) in trans-disciplinary research, particularly in studies of **novel stressors, urban freshwaters and interactions between human recreation and freshwaters** as socio-ecological systems.

IGB's mission is grounded in the vision of developing a systemic understanding of aquatic networks that extend from the headwaters to the sea and are strongly influenced by human activities. This requires research on the coupling of the mechanisms underlying biogeochemical, chemical-biological, spatial and environmental-social interactions. To implement the new research directions at the envisioned, hitherto unprecedented level of integration across disciplines and scales, IGB intends to apply for additional institutional funding via a permanent '**extraordinary item of expenditure of a scientific-strategic nature**' (Sondertatbestand). These funds are to cover costs for major investments in equipment, the development of IGB's large field infrastructures, and salaries of specialised non-scientific staff and of scientists with novel expertise. IGB estimates the total financial requirements at € 4.96 M, staggered over three years from 2021-2023 (on average € 1.65 M per year, including the institute's estimated contribution of € 0.46 M per year from its core budget). The estimated increase in institutional funding from 2024 on would amount to € 0.74 M.

i. Stable isotope analyses

State-of-the-art spectrometers for lab and field applications of stable-isotope techniques to track elements and molecules in the abiotic environment (air, water, solids) and in food webs

Equipment: EA-IRMS, GB-IRMS, Field IR laser spectrometer (€ 0.94 M in total, planned acquisition in 2021)

ii. Molecular biodiversity analyses ('Omics')

High-throughput instruments for semi-automated (meta)genomics and (meta)transcriptomics of environmental samples, including free DNA (eDNA), to examine the genetic makeup and gene expression of individuals, populations and communities across all organismic groups from bacteria and algae to fish and amphibians at high resolution

Equipment: Automated DNA extraction, pipetting robot and accessories, sequencer (€ 0.51 M in total, planned acquisition in 2021)

iii. Development of field infrastructure

IGB LakeLab, 3D telemetry system, long-term measurement stations in three lakes and two rivers: € 0.26 to 0.29 M annually beginning in 2021 (€ 0.83 M in total)

iv. Personnel*Stable isotope analyses*

- a. Stable-isotope engineer (E12)
- b. Hydrological modeller (E13)
- c. Environmental chemist (E13)

Molecular biodiversity analyses (Omics)

- d. Spatial analyst (E12)
- e. Bioinformatician (E13)
- f. Ecological genomicist/systematicist (E13)
- g. Fish physiologist (E13)

Field infrastructure

- h. Metrology engineer (E12)
- i. Data manager (E10)
- j. Lab manager (E12)
- k. Computational ecologist (E13)

All three areas

- l. Knowledge-transfer officer (E13)

Costs: € 0.86 to 0.92 M annually beginning in 2021 (€ 2.68 M in total). This includes IGB's own contribution (€ 1.37 M, see above), which is equivalent to six of the 12 positions.

Appropriateness of facilities, equipment and staffing

In 2017, the **institutional funding** by the Federal and *Länder* governments totalled € 13.5 M (see appendix 3); compared to the last evaluation (reference year 2010), institutional funding increased by nearly 33 %. Yet, as IGB points out, because of disproportionate cost increases (especially increases in pay rates), because of much lower increase rates in the core budget than the recent salary increases, a structural deficit of currently about € 0.4 M annually has accumulated since 2016. In addition, according to IGB, there is a persisting shortage of core funding for research running costs of more than € 0.5 M per year.

IGB's **third-party funding** contributed 7.6 M€ to its revenues in 2017; in the past three years (2015-2017) this averaged out at 33 % of IGB's revenues (between 30 and 36 %). In the main, IGB raised funds provided by the Federal (BMBF) and *Länder* governments, the German Research Foundation (DFG), and the EU. Furthermore, IGB has been regularly successful at obtaining funds through the Leibniz Competition.

Buildings

IGB is distributed over **four sites**: two sites are on Lake Müggelsee, where most of IGB's staff is located, one in temporarily rented rooms near the Adlershof Campus of the Humboldt-Universität zu Berlin, and one 80 km north of Berlin at Lake Stechlin.

According to IGB, space has been the foremost limiting resource in recent years, despite the conversion of rooms at both the Müggelsee and Stechlin location to office and laboratory space. However, as the institute points out, this situation is likely to change in the future (by 2022) with the construction of a biodiversity building (€ 7.4 M) that IGB will

share with the Freie Universität Berlin on its campus. The Adlershof site will be abandoned at this point. In addition, part of an € 1.5 M has been earmarked for the refurbishment of an old building at the Stechlin site as of 2021.

Research Infrastructure

IGB has conceived and maintains two large-scale research infrastructures, its **LakeLab** in Lake Stechlin and the **3D-telemetry system** in Lake Döllnsee, in addition to IGB's **long-term monitoring stations** in Lakes Müggelsee and Stechlin. Additional smaller facilities are run in Lake Arendsee (monitoring station and underwater enclosures) and an extension is planned on the River Spree. Equipment of a small stream catchment is also foreseen. Operation of these facilities, as IGB points out, requires considerable annual investments.

IT

Following previous recommendations, the IT staff at IGB has been increased from 2.5 to 4.0 full-time equivalents. A new head of the IT team was hired in 2016, who started to initiate major hardware, software and organisational improvements. Additional IT competencies and work capacities were provided by three technicians.

According to IGB, further expansion of IT personnel is highly desirable, especially in view of the development of computationally intensive science. Moreover, as was already noted by the review board in 2011, IGB's IT infrastructure requires a fundamental overhaul. Of the necessary investments (€ 1.9 M) that had been identified for the Müggelsee site, only € 0.5 M have been granted so far for 2019. Additional investment funds for IT infrastructure at the Stechlin site are part of the refurbishment mentioned above.

Data management

Research data at IGB comprise various kinds of environmental data, ranging from classic survey and monitoring to field-sensor, genomic and geodata. During the last years, IGB has worked on establishing workflows for the efficient management of these data. To this end, a data base manager was hired and a Data Policy adopted in 2014. IGB embraces the principles of open data and has hence continued to develop solutions that improve public access to its data collected with support of public funds. This applies particularly to IGB's long-term time series. Furthermore, IGB is hosting and supporting its Freshwater Information Platform (FIP). Genomic and other research data used in publications are commonly stored on external repositories (e.g., GenBank, Dryad).

In addition to managing its research data, IGB has set up an information system on its ongoing activities. The recent recruitment of a new head of the library and information officer has facilitated these tasks, the goal being to transform the IGB library into a science information centre.

For the appropriateness of IGB's staffing see chapter 5.

3. Subdivisions of IGB

Department 1: Ecohydrology (Prof. Dr. Dörthe Tetzlaff)

[33.6 FTE, thereof 17.4 FTE Research and scientific services, 1 Post-doctoral fellow, 8.1 FTE Doctoral candidates, and 7.1 FTE Service staff]

Department 1 investigates ecohydrological mechanisms and processes of natural and anthropogenically influenced aquatic and terrestrial ecosystems, and their interactions. The department integrates empirical knowledge, based on quantitative measurements, and process-based modelling frameworks across different spatio-temporal scales. The aim is to facilitate sustainable water management in a changing world. Since the last evaluation, the department has developed two research foci: (i) landscape-riverscape connections and (ii) in-stream ecohydrological/ecohydraulic connections. In August 2017, a new head of department took office.

Research groups:

Ecohydraulics	Fluvial Ecosystem Ecology
Groundwater-Surface Water Interactions	Landscape Ecohydrology
Light Pollution and Ecophysiology	Nutrient Balances in River Basins
	Physical Limnology

The department uses stable isotopes to understand ecohydrological water partitioning and implications for ecosystem services across the wider North. Novel, tracer-aided models were developed to assess how the partitioning of plants and consequent water balance are likely to be affected by environmental change. Furthermore, the department investigates impacts of artificial light at night (ALAN) at the landscape-riverscape interface demonstrating that ALAN is an anthropogenic stressor with biological impacts on a wide range of processes. Furthermore, the department was engaged in modelling applications to simulate nutrient emissions, riverine retention and the resulting loads received by aquatic ecosystems in European, South-American and Asian river catchments, which allowed identifying and analysing large stressor gradients and helped quantifying eutrophication risks caused by long-term nutrient enrichments. In its research on in-stream ecohydrological/hydraulic connections, the department aims to advance knowledge on the interactions between momentum/mass fluxes and aquatic biota in fluvial systems. Recent projects examined effects of aquatic vegetation on ecohydraulic processes, transport and mixing at river confluences. Small and medium-scale effects of groundwater on streams and lakes were investigated to enhance understanding of the complex interactions between physical, chemical and biological processes in hyporheic zones.

Between 2015 and 2017, members of the department published 132 articles in peer-reviewed journals, 23 work and discussion papers, 19 individual contributions to edited volumes, 11 articles in other journals as well as five edited volumes/monographs. Of these publications (total: 190), 35 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 4.9 M. They were predominantly obtained from the EU, DFG and Federal and *Länder* governments. Ten doctoral degrees and one habilitation were completed.

In the next few years, Department 1 aims to strengthen integration of its ecohydrological expertise to investigate anthropogenically influenced and disturbed ecosystems. To this

end, the department aims to organise its central research topics along three overarching themes: (i) global-change impacts, (ii) eutrophication and biogeochemistry, and (iii) water management and biodiversity.

Department 2: Ecosystem Research (Prof. Dr. Rita Adrian)

[41.7 FTE, thereof 18.2 FTE Research and scientific services, 1 Post-doctoral fellow, 10.8 FTE Doctoral candidates, and 11.7 FTE Service staff]

Department 2 explores the temporal and spatial scale-dependent development of lakes and rivers, focusing on how changes in climate, land use, hydromorphology, and extreme events affect the resilience and services that ecosystems provide for society. The department combines ecological and evolutionary theory with empirical data. Increasingly, 'big data' approaches are used to analyse environmental impacts, and to develop models, scenarios, assessments, and management strategies.

Research Groups:

Disease Evolutionary Ecology	Aquatic-Terrestrial Coupling and Regime Shifts
Ecological Novelty	Functional Ecology and Management of Rivers & Lake shores
Global Change Effects on River Ecosystems	Long-term and Climate Impact Research of Lake Ecosystems
Molecular Ecology and Genomics	Photosynthesis and Growth of Phytoplankton & Macrophytes

Based on long-term empirical data, the department found that early-warning indicators of regime shifts do not provide reliable and consistent signals of impending critical transitions in lakes. Therefore, the need for a probability check was addressed in the context of the conjunction rule in order to apply early-warning indicators more successfully. The empirical findings were also integrated in ecological theory. As one example of its biodiversity research, the department examined the role of streamflow and land use on invertebrate distribution and its prediction. This work led to regular reports to regional and national stakeholders. The department also developed the concept of co-evolutionary experience to better predict impacts of invasive species. As a missing link in aquatic food webs, it was discovered that parasite infections of cyanobacteria can result in high-quality food to sustain zooplankton during cyanobacterial blooms.

Between 2015 and 2017, members of the department published 223 articles in peer-reviewed journals, seven individual contributions to edited volumes, and six work and discussion papers. Of these publications (total: 241), 47 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 4 M. They were predominantly obtained from Federal and *Länder* governments, the EU, DFG and Leibniz Competition. Fourteen doctoral degrees were completed.

In the coming years, Department 2 aims at further integrating its expertise to investigate how environmental change affects freshwater biodiversity and the metabolism and resilience of lakes and rivers. The role of parasites and invasions in food webs will be studied to develop genomic tools and novel indicators. Furthermore, key pressures on ecosystem functioning will be identified to support biodiversity and ecosystem management by integrated modelling approaches.

Department 3: Experimental Limnology (Prof. Dr. Mark O. Gessner)

[39.7 FTE, thereof 15.4 FTE Research and scientific services, 1 Post-doctoral fellow, 8.9 FTE Doctoral candidates, and 14.4 FTE Service staff]

Research in Department 3 addresses (i) impacts of environmental change on the structure and functioning of aquatic ecosystems and (ii) the biodiversity, interactions and functions of aquatic microbiota. Central to the department's work are large-scale enclosure experiments making use of IGB's LakeLab at Lake Stechlin, which is operated by the department. Important new or expanded thematic foci developed in recent years include ecosystem responses to global environmental change, the roles of fungi in fresh waters, microbial genomics and urban ecology.

Research Groups:

Aquatic Microbial Ecology

Experimental Phytoplankton Ecology

Microbial Ecology of Sediments

Ecosystem Processes

Experimental Zooplankton Ecology

Theoretical Ecology

An example of research results on ecosystem impacts of global change relates to a large experiment designed to assess the consequences of extreme storm events on lakes. The experimental results match the key conclusions of a long-term time-series analysis covering an exceptional natural storm. On a conceptual level, attention was directed to synthetic organic compounds as a key component of global environmental change, based on a synthesis of data on industrial chemicals worldwide. In its research on microbiota, metagenomic analyses led to the discovery of an exceptional genetic diversity within the giant freshwater bacterium *Achromatium oxaliferum*. Furthermore, a synthesis of research on an inconspicuous but widespread green alga established a new systematic that recognises cryptic diversity and convergent evolution towards coccoid unicells.

Between 2015 and 2017, members of the department published 156 articles in peer-reviewed journals, 16 work and discussion papers and 8 individual contributions to edited volumes. Of these publications (total: 183), 35 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 3.4 M. They were predominantly obtained from the DFG, Federal and *Länder* governments and the Leibniz Competition. Five doctoral degrees were completed.

In the coming years, Department 3 aims to use ecosystem-scale experiments in realistic field settings to make accurate assessments of ecosystem impacts by multiple stressors (e.g. light pollution, warming) and to analyse microbial diversity, food webs and processes. Progress in both focal areas will be facilitated by adapting and newly developing methodologies that range from enhanced sensor technology to fish and zooplankton tracking, molecular analyses of trophic interactions and microbial taxonomic and functional diversity. Additional efforts are planned to curate and exploit the long-term data set of Lake Stechlin and other lakes.

Department 4: Biology and Ecology of Fishes (Prof. Dr. Jens Krause)

[34.9 FTE, thereof 18.6 FTE Research and scientific services, 3 Post-doctoral fellows, 3.3 FTE Doctoral candidates, and 10 FTE Service staff]

Department 4 aims to understand ecological and evolutionary processes that structure freshwater fish communities and affect their functions. These insights advance knowledge and are used to improve the management and conservation of wild fish populations. This covers the socioecological dimension of human-aquatic ecosystem interactions. Department 4 integrates hypothesis-driven laboratory and mesocosm experiments, whole-lake manipulations, and comparative field studies, complemented by theoretical studies and fish population modelling.

Research Groups:

Causes and Consequences of Behavioural Types	Experimental Fish Biology
Food Web Ecology and Fish Communities	Integrative Recreational Fisheries Management
Mechanisms and Functions of Group-Living	Reintroduction of the European Sturgeon to Germany
River Revitalization	

A key focus over the last few years has been on the causes and consequences of variation in fish behavioural types (B-Types project) and how such variation affects conservation and fisheries management. Social-ecological research on fisheries demonstrated the specific conditions under which fish stocking is successful. This knowledge was transferred into practice, particularly through a policy document on sustainable recreational fisheries published by the Food and Agricultural Organisation of the United Nations (FAO), which has led to policy adjustments worldwide. The department's work on river restoration resulted in the finding that species recovery in the long run is primarily determined by habitat quality, whereas the influence of migration barriers is weak. Furthermore, large-scale impacts of climate and land-use change on fish distribution are spatially variable and mostly antagonistic. Department 4 also focuses on biodiversity assessment in urban water bodies and is in charge of a long-term sturgeon restoration program.

Between 2015 and 2017, members of Department 4 published 194 articles in peer-reviewed journals, 39 articles in other journals as well as 13 individual contributions to edited volumes. Of these publications (total: 263), 46 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 3 M. They were predominantly obtained from Federal and *Länder* governments, the DFG, EU and Leibniz Competition. Six doctoral degrees were completed.

In the coming years, Department 4 aims to carry out controlled laboratory and mesocosm studies on key aspects of fish-decision making and inter-individual variation to be scaled up to ecosystem level. Central in this respect is a fully interactive robotic fish system established in the department. The department also aims to develop strategies to assess, promote and protect freshwater biodiversity, especially by developing innovation in management by including stakeholders in whole-ecosystem experiments.

Department 5: Ecophysiology and Aquaculture (Prof. Dr. Werner Kloas)

[24.7 FTE, thereof 11.5 FTE Research and scientific services, 1.5 Post-doctoral fellows, 3.2 FTE Doctoral candidates, and 8.5 FTE Service staff]

Department 5 investigates the ecophysiological impacts of multiple environmental factors (natural and anthropogenic) on aquatic vertebrates, especially fishes and amphibians. The goal is to generate scientific baseline information on vertebrate ecophysiology, ecotoxicology and sustainable aquaculture. To this end, the department aims to determine how biotic and abiotic factors stress or influence physiological functions relating to reproduction, stress, development, nutrition, growth, and behaviour. Animal welfare and efficient resource utilisation in aquaculture are thematic foci, and functional and evolutionary genomics are important approaches to address both fundamental questions and practical problems.

Research Groups:

Aquaponics	Effects of Endocrine Active Substances
Evolutionary Biology & Ecotoxicology of Amphibians and Fish	Fish Genetics
Fish Parasitology and Immunology	Fish Pathology and Ecotoxicology
Molecular Fish Physiology	

The department's research in ecophysiology and ecotoxicology also addresses environmental impacts such as artificial light at night, potash mining effluents and pharmaceuticals, microplastics, and endocrine disruptors, alone or in combination with other stressors. These studies aim to elucidate physiological consequences on reproduction, stress and the immune system of fishes. Cooperations with industrial partners have been established to develop products based on fulvic acids to increase resistance against stress and infectious diseases in aquaculture. Moreover, the aquaponic system designed at IGB, which couples fish and soilless vegetable production, was transferred into two demonstration plants. IGB's research programme on reintroducing sturgeons in the wild was also supported by members of the department.

Between 2015 and 2017, members of the department published 90 articles in peer-reviewed journals, 36 articles in other journals as well as five work and discussion papers. Of these publications (total: 134), 33 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 2.3 M. They were predominantly obtained from Federal and *Länder* governments, the DFG and EU. Nine doctoral degrees were completed.

In the coming years, Department 5 will continue its research lines on impacts of artificial light at night, potash mining effluents, and microplastics in combination with other pollutants as stressors. Sustainable aquaculture and sturgeon restoration will remain major focal research areas. However, the department will strongly incorporate genomic approaches to advance understanding of the evolution and biology of farmed freshwater vertebrate species.

Department 6: Chemical Analytics and Biogeochemistry (Dr. Jörg Gelbrecht)

[15.5 FTE, thereof 5.8 FTE Research and scientific services, 2.2 FTE Doctoral candidates, and 7.5 FTE Service staff]

Research of Department 6 revolves around the biogeochemical cycling of elements and compounds in freshwater ecosystems. Central to its work is the turnover of carbon, nutrients and xenobiotics, as well as the role of organisms and abiotic factors in these cycles in changing environmental conditions and across scales ranging from microbes to the catchment. Department 6 integrates field studies and laboratory experiments, chemical analyses in liquid and solid samples, isotope signatures and biomarkers, and analytical and numerical modelling. An important service function of Department 6 is to manage IGB's central chemical laboratory that provides analyses to all departments (with 50 % of its staff time allocated to this service). As a part of the service, the department also maintains IGB's long-term analyses of surface water quality.

Research Groups:

- Biogeochemistry and Restoration of Peatlands
- Biogeochemical Processes in Sediments & Lake Management
- Carbon Dynamics and Anthropogenic Stressors in Aquatic Systems
- Nutrient Cycles and Chemical Analytics

Research in the department has resulted in detailed insights into diagenetic processes of lake sediments. This includes evidence for sedimentary vivianite formation under anoxic conditions, a process that proved to be quantitatively significant for phosphorus sequestration in waterlogged soils and aquatic sediments. Moreover, based on an integrative analysis of phosphorus pools and fluxes in a highly eutrophic lake, a model tool has been developed to predict the effectiveness of management options. Further research in the department showed that small water bodies are biogeochemical hotspots of greenhouse gas emissions at the landscape scale. The impact of peatland restoration measures on greenhouse gas emissions, nutrient retention and biodiversity protection was also demonstrated. Finally, by combining stable-isotope tracing and biomarker analysis, the department gained insights into coupled aquatic-terrestrial carbon cycling mediated by fungi and bacteria.

Between 2015 and 2017, members of the department published 65 articles in peer-reviewed journals, 3 monographs as well as 3 individual contributions to edited volumes. Of these publications (total: 72), 32 were co-authored by scientists affiliated with other departments of IGB. In the same period, the revenues from project grants totalled € 0.65 M. They were predominantly obtained from the DFG, Federal and *Länder* governments and the Leibniz Competition. Three doctoral degrees were completed.

In the coming years, Department 6 aims to deepen knowledge on coupled biogeochemical processes in both natural lakes and wetlands and in disturbed landscapes such as urban and mining areas. Additionally, the fate of novel environmental pollutants and anthropogenic chemical stressors in aquatic ecosystems will be investigated. An important methodological aim is to establish stable isotopes as a versatile tool used at IGB across all departments to examine biogeochemical and physiological processes as well food-web dynamics in freshwater systems and organisms.

4. Collaboration and networking

Collaboration with universities

IGB and universities in the Berlin-Brandenburg region are connected via 10 joint professorships:

Freie Universität Berlin (FU)

- Ecological Novelty (W3/Heisenberg professorship [externally funded by DFG], Jonathan Jeschke/Dept. 2, 2014)
- Aquatic Evolutionary Ecology (W2, Justyna Wolinska/Dept. 2, 2015)
- Limnology (adjunct professorship, Rita Adrian/Head of Dept. 2, 2012)

Humboldt-Universität zu Berlin (HU)

- Hydrology (C3, Gunnar Nützmann/Deputy Head of Dept. 1, 2002)
- Endocrinology (W2, Werner Kloas/Head of Dept. 5, 2002, W3 since 2010)
- Integrative Fisheries Management (W1, Robert Arlinghaus/Dept. 4, 2006, W2 since 2012)
- Biology and Ecology of Fishes (W3, Jens Krause/Head of Dept. 4, 2009)
- Ecohydrology (W3, Dörthe Tetzlaff/Head of Dept. 1, 2017)

Technische Universität Berlin (TU)

- Applied Aquatic Ecology (W3, Mark Gessner/Head of Dept. 3 and Acting Director, 2011)

Universität Potsdam (UP)

- Aquatic Microbial Ecology and Functional Biodiversity (W2, Hans-Peter Großart/ Dept. 3, 2011)

The new director of IGB [Victoria Braithwaite] will take office in September 2018. At the same time, she will be appointed at the FU Berlin as a joint W3 professor of Freshwater Science. Further plans include a joint professorship with the Geographical Institute of HU and a joint W2 professor with the TU Berlin and the Helmholtz-Centre Potsdam – German Research Centre for Geosciences Potsdam (GFZ).

Between 2015 and 2017, 30-40 scientists at IGB taught each year at typically six universities in Germany and at two to six universities abroad. In total, 40-50 courses and lectures were offered, corresponding to approx. 100-130 teaching hours per semester. Major teaching activities include the international Master programme in “Fisheries Science and Aquaculture” at HU Berlin and the graduate programme “Biodiversity, Evolution and Ecology” at FU Berlin. On average, IGB scientists served as main advisor for 16 completed doctoral dissertations per year (for graduate schools see chapter 5).

IGB took part in initiating the following major **collaborative research initiatives** with universities in the Berlin-Brandenburg region:

- Berlin-Brandenburg Institute of Advanced Biodiversity Research (BBIB, with the FU Berlin, TU Berlin and other research institutes)
- Berlin Center for Genomics in Biodiversity Research (BeGenDiv, together with the FU Berlin and other research institutes)
- Integrative Research Institute on Transformations of Human-Environment Systems (IRI ThESyS, at the HU Berlin)
- DFG Priority Programme 1704 – Flexibility matters: Interplay between trait diversity and ecological dynamics using aquatic communities as modal systems (DynaTrait, coordinated at the University of Potsdam)
- Humboldt-Princeton Strategic Partnership

IGB is involved in two proposals for **Excellence Clusters** in Germany's current Excellence Strategy. One of them ('Science of Intelligence') is led by the HU Berlin and also involves the TU Berlin, another is coordinated by the University of Constance.

Collaboration with other research institutions

Within the Leibniz-Association, IGB has established preferential relationships with the Leibniz Centre for Agricultural Landscape Research (ZALF), the Leibniz Institute for Baltic Sea Research (IOW) and the Leibniz Institute for Analytical Sciences (ISAS). IGB is part of the **Leibniz Research Alliances** "Biodiversity", "Sustainable Food Production and Healthy Food Consumption" and "Infections 21". It also coordinates the **Leibniz research network** "Loss of the Night" that addresses the impact of artificial light at night on culture, society, human health, economics, ecology, and coupled natural-social systems.

On the national level, IGB has initiated strategic partnerships with the Helmholtz-Centre for Environmental Research (UFZ) and the Helmholtz-Centre Potsdam – German Research Centre for Geosciences.

On the European level, IGB has coordinated several projects involving many partners, such as BioFresh (Network for Global Freshwater Biodiversity, 2010-2014), INAPRO (Innovative Aquaponics for Professional Application, 2014-2017) and AQUACOSM (2017-2020). In several other EU-funded projects, IGB scientists have served on steering committees and as work package-leaders.

Between 2015 and 2017, 217 scientists from 32 countries spent more than one week at IGB. IGB stimulated international exchange by means of its Frontiers in Freshwater Science fellowship programme. In turn, 65 IGB scientists spent at least one week as academic visitors at foreign universities or research institutions.

IGB's proportion of staff from abroad was 32 % on 31 December 2017.

Other collaborations and networks

According to IGB, important research projects have been carried out at the **interface of science and policy**. Examples of such projects funded by the Federal Ministry of Science and Education (BMBF) are GLANCE (Global Change Effects in River Ecosystems), which brings together five academic and two applied partners (2014-2018), and several water

management projects, e.g. Nitrolimit I and II (Nitrogen Limitation in Inland Waters), involving six scientific partners and six associated non-scientific stakeholders, or MoMo II and III (Integrated Water Resource Management in Central Asia: Model Region Mongolia) with both Mongolian and German partners (2010-2013 and 2015-2018).

Several of IGB's research projects involve collaborations with **enterprises, associations** or **public agencies**, such as the Angling Association of Lower Saxony and the water authority of the state of Mecklenburg-Pomerania. On a national level, IGB is a founding member of the German Water Science Alliance (WSA) and continues to be active in the executive board. IGB also took the lead in the newly established global Alliance for Freshwater Life (AFL).

5. Staff development and promotion of junior researchers

Staff development and personnel structure

As of 31 December 2017, IGB employed 235 people (200.2 full-time equivalents), 143 of which were scientists, 75 working in service positions, 14 in the institute's administration and three as trainees (see appendix 4). In addition, the Forschungsverbund Berlin e. V. carries out administrative services in the areas of personnel and finance.

The executive staff of IGB has undergone major changes since the last evaluation. Most importantly, the former director left IGB in 2016 when he became president of Austria's funding organisation for basic research; until September 2018 when a new director will take office, one of the department heads serves as acting director. Furthermore, three of the six department heads have been replaced, two of them in joint professorship procedures with universities. At the group leader level, eight changes have taken place, corresponding to 22% of the academic staff.

IGB has introduced an EU-certified Human Resource Strategy, which applies to the recruitment of scientific, technical and administrative staff. As part of this strategy, IGB has set up recruitment guidelines which are available on the webpage to ensure maximum transparency. IGB offers skill development measures to scientists at every career level as well as to administrative and technical staff. Continued education of technicians is one of the focal areas of IGB's renewed Human Resource Strategy for the period 2017-2020, for which IGB recently received approval from the EU.

Promotion of gender equality

On 31 December 2017, 36% of the employees in research and scientific services were women. On the leadership level, two of the six departments (33 %) and nine of the 39 research groups (23 %) were led by women. Of the 10 professors at IGB, three were women, with the new director joining IGB in summer 2018 as a fourth female professor. As emphasised by IGB, there were no women in 2011 among either the department heads or the professors at IGB. These changes in IGB's gender balance are a result of the fact that all leadership positions that opened since 2011 were filled with women.

IGB has established target quotas for the scientific personnel according to the ‘cascade model,’ thus striving to recruit scientists at the gender ratio realised at the next lower career level. Moreover, the career development of junior female scientists is supported by various measures, including an Equal Opportunity Fund launched in 2011 which currently has an annual budget of 45 k€.

IGB has also taken steps to improve the compatibility of family and work, which is another focal area of IGB’s Human Resource Strategy for the years 2017-2020. These measures target especially young scientists to help reconcile family obligations with a career.

Promotion of junior researchers

By the end of 2017, altogether 60 doctoral students worked at IGB, including 17 supported by external funding. Between 2015 and 2017, a total of 47 doctoral degrees were awarded, as well as 71 academic degrees qualifying for doctoral work. One habilitation was successfully completed in this period.

IGB has continued its **doctoral programme** established in 2009, which consists of course work, coaching and a structured supervision that includes advisory committees and an electronic tracking system to monitor progress systematically. The doctoral programme is organised by a career development coordinator. In 2016, IGB updated its rules for conducting doctoral research and restructured the supervision process to raise awareness for the time constraints of dissertations and improve time management.

IGB also participates in several **graduate schools**, notably the DFG Graduate School Urban Water Interfaces (UWI, jointly with TU Berlin), the EU-funded Initial Training Network INTERFACES, the Innovative Training Networks HypoTRAIN and MANTEL as well as the International Leibniz Graduate School AquaLink with the Universities of Southern Denmark and Aberdeen in Scotland as partners. In addition, IGB participates in the graduate programme “Biodiversity, Evolution and Ecology” and the Erasmus Mundus Joint Doctorate Programme Science for the Management of Rivers and Tidal Systems (SMART), both at the FU Berlin.

In 2015, IGB started a **skill-development programme for postdoctoral fellows**. It offers annual retreats, postdoctoral networking, skill-enhancement courses and workshops as well as coaching and training by senior IGB staff and external experts.

Vocational training for non-academic staff

IGB offers traineeships to become office manager and laboratory technician (biology and chemistry). In 2015, three vocational qualifications were completed. Currently, three trainees are working at IGB.

6. Quality assurance

Internal quality management

Internal quality management instruments of IGB include formal annual reviews and career talks, an ombudsperson, rules of good scientific practice (based on guidelines issued by the DFG) and a Grant Proposal Committee. Quality assurance and quality control of

laboratory analyses and field sensors is based on DIN or ISO standards. All chemical analytical methods are calibrated with certified standards. After completion of analyses, samples are stored at -20 °C until data have been quality-controlled. Records of analytical results of environmental field and laboratory samples are archived for at least 15 years.

IGB has implemented an internal system of performance-based resource allocation, which was last revised in 2012. Based on a total sum of 200 k€ that is annually distributed, 40 % are allocated as lump sums irrespective of performance (i.e. 2.000 Euro of annual base funding for each tenured and tenure-track scientist) and 60 % are distributed to IGB's research units based on performance, where performance is assessed according to IGB's allocation rules. The key criterion is the crudely estimated relative quality (based on ranks derived from journal impact factors) and number of publications in the three preceding years.

Quality management by the Scientific Advisory Board and Supervisory Board

The Scientific Advisory Board (SAB, see also chapter 1) assesses IGB's scientific work and gives advice on the institute's strategic development. The board meets annually and advises the director, the department heads and the Board of Trustees of the FVB on the scientific work programme of IGB. The SAB is also involved in strategic decisions on human resources and on the acquisition of major instrumentation. Midway between two external evaluations the SAB conducts an audit.

Implementation of recommendations from the last external evaluation

IGB responded as follows to the 18 recommendations of the last external evaluation (highlighted in italics, see also statement of the Senate of the Leibniz Association issued on 14 March 2012, pages B-3/B-5):

General Research Concept and Departments (Chapter 2)

- 1) *The IGB's high commitment to socially relevant topics such as the protection of the climate and environment, or the preservation of biodiversity, is manifestly evident. An intensified **commitment to application-orientated issues** that could be jointly worked on with commercial or industrial partners is also conceivable. Work on such issues and questions could also have a positive **effect on the Institute's finances**. The IGB is therefore encouraged to examine possibilities leading to the establishment of appropriate co-operations, especially in the areas of inland fisheries and aquaculture.*

As IGB points out, it has initiated several large collaborative projects that are strongly application oriented (cf. Chapter 4). These projects involve private enterprises, associations and public agencies. Additionally, IGB has developed an overarching concept that blends knowledge and technology transfer with PR activities in a Science-Society-Interface. The concept goes beyond the monetary exploitation of products, technologies and patents. Instead, the focus is on transferring information and knowledge to policy representatives, environmental agencies and society at large. Since 2013, these activities have been coordinated by a Knowledge & Technology Transfer officer (cf. Chapter 2).

- 2) [...] *the recommendation is systematically to expand the strategic function of the **cross-cutting research domains (CCRD)** and use them further to strengthen the development of interdisciplinary as well as disciplinary work in the individual departments and to promote new topics and issues flexibly. In order to achieve this expansion, the IGB should make more resources from institutional funding available and raise additional third-party funding.*

According to IGB, the cross-cutting research domains (cf. Chapter 2) have played an essential role in ensuring intense collaboration among departments and across disciplines. The institute states that this has resulted not only in a large number of cross-departmental projects and publications, but also in a culture of open intellectual exchange and collaboration extending beyond the cross-cutting research domains. Multiple projects were acquired through the cross-cutting research domains.

Co-operation

- 3) [...] *The IGB is encouraged to continue with this commitment in the **Water Science Alliance** activities in order actively to help shape the strategic setting of priorities for German aquatic research.*

IGB, as it points out, contributes actively to the German Water Science Alliance (WSA), both financially and by serving on its committees.

Work Results

- 4) [...] *the IGB has the potential to improve its **publication performance** [...] and the Institute's relevance and visibility at a national as well as international level.*

Based on a comparison of journal articles published between 2015 and 2017 and the three years before the last evaluation (2008-2010), IGB has increased the quality and quantity (by 80 %) of its publications in peer-reviewed journals (cf. Chapter 2 "Results"). Moreover, papers directly relevant to policy issues have complemented IGB's publication portfolio.

- 5) *With its **limnological long-term data**, the IGB has valuable material at its disposal which should be analysed more comprehensively. It is recommended that this material is made available also to external researchers.*

According to the institute, analyses of IGB's long-term data have been a core part of its research, resulting in more than two dozen peer-reviewed publications and also contributing to the last IPCC report. The long-term research stations in Lakes Müggelsee and Stechlin are embedded in an open international scientific network. An IGB data base established by a new data manager has facilitated data exchange with the scientific community (cf. Chapter 2 "Data management").

- 6) *The Institute is encouraged to promote and further the **transfer** and utilisation of its research work. At the same time, it should be mindful of a proportionate relationship between cost and benefit.*

IGB has established a Science-Society-Interface (SSI) strategy that has resulted in many initiatives to increase the societal impact of IGB's results and knowledge on freshwaters and to do so in an efficient way (cf. chapter 2 and recommendation 1).

- 7) *The workshops and conferences organised by the IGB are very important to its perception domestically and abroad. The Institute should therefore **intensify its commitment to host important international meetings.***

IGB gives a number of examples of international conferences organised or co-organised by the institute (cf. chapter 2 “Academic events”).

Financial Resources and Use Thereof

- 8) *Owing to the intensive renewal process, the institute’s operational costs have increased significantly, but an adequate adaptation of **institutional funding** has not taken place. Therefore, it is recommended that (1) the IGB in co-operation with its supervisory bodies examine to what extent the additional needs accrued during this ongoing renewal can be covered with funding from the 5% increase provided by the “Pact for Research and Innovation”, and that (2) additional funds will be applied for if needs cannot be covered in this framework.*

The issue has not been resolved. According to IGB, there remains an urgent need to increase IGB’s core budget to cover the increasing running costs, investment needs and especially salaries (cf. Chapter 2 “Appropriateness of funding”).

- 9) *The most urgent need at the moment is **space.** [...]*

The institute points out that severe space problems at IGB persist and have even aggravated, despite diverse measures to alleviate the situation in Berlin and Stechlin (cf. chapter 2). However, a new building for which funding has been secured and that is currently planned as a building to be shared with the FU Berlin is expected to alleviate the space constraints as of 2022.

- 10) *The plans by Department 3 (Limnology of Stratified Lakes) to establish **mesocosm facilities** find strong approval and would most likely attract a high level of international co-operation.*

The mesocosm facilities were established based essentially on funding provided by a BMBF grant and additional support received from the DFG for establishing a core facility (LakeLab; for details see Chapter 2 “Infrastructure”).

- 11) *The IGB plans to expand theoretical research in terms of modelling of systems and processes, as well as corresponding foundations in bioinformatics, which is highly welcomed and considered necessary. This not only requires appropriate investment in **IT infrastructure** but also the strengthening of **personnel.***

Since the last evaluation, IGB has recruited two theoretical biologists strengthening the institute’s expertise in ecological modelling and theory. Furthermore, a joint professorship in bioinformatics had been temporarily filled. The new head of IT hired in 2016 has developed a concept to refurbish IGB’s IT infrastructure. This requires major investments, which had been earmarked but so far only a small part was firmly secured and can be spent as of 2019 (cf. chapter 2 “IT”).

- 12) *The IGB plans to balance its budget at a ratio of two-thirds institutional funding and one-third external funding; this is considered reasonable. In this respect, the IGB should further increase its **fundraising** – with special emphasis on funds from the DFG.*

According to the institute, the acquisition of competitive funds has increased since the last evaluation, amounting to € 6.2 M (30 %) of the total annual budget in 2017. Funding by the German Research Foundation (DFG) has almost doubled (cf. chapter 2 and appendix 3). An additional increase in the proportion of third-party funds would not only meet major space constraints but also be financially unsustainable, because project costs are never fully covered, requiring additional support by IGB's base funding.

Personnel

13) *The IGB's plans to strengthen work in the fish departments (Departments 4 and 5) are strongly supported, as is the co-operation between these departments through the additional scientific **position of a metabolic physiologist**.*

According to IGB, a joint position was ready to be opened in 2016 when the former director left to become president of the Austrian Academy of Science. Therefore, the decision was put on hold until IGB's new director has taken office.

14) *The creation of at least one additional scientific position to advance **theoretical and numeric modelling** work is also considered necessary.*

IGB states that four research group leaders hired since 2012 have helped to strengthen ecological theory and modelling at the institute (cf. Chapter 1 "Development").

15) *[...] an appropriate increase in **numbers of technical and administrative personnel** is necessary. It is recommended that the IGB together with its supervisory and funding bodies consider the measures which can be taken in order to achieve this, in addition to increasing the flexibility of the staff appointment scheme which would be possible from 2012. Additional personnel are urgently needed especially in the area of **IT**, owing to a broadening and increase in duties.*

Within IGB's flexible staff appointment scheme, a new head of IT was hired and an additional IT position was created in 2016. In addition, the administration and the library/information centre were strengthened by recruiting new staff. Most recently, an operations manager was hired to professionalise IGB's facility management.

16) *Only one employee possesses the **license required to captain the research vessel**, which represents a risk. The IGB should implement safeguards to ensure smooth operation irrespective of a specific person.*

An additional technician has been trained for now three years to obtain the captain licence. The entire training programme is expected to take five years.

17) *The IGB must find ways [...] to **encourage applications from women** [...] in order to **achieve gender balance** also at the management level.*

As IGB points out, its efforts to recruit women scientists in leadership positions have been successful (cf. chapter 5). Three female professors, two of them department heads, have been appointed and three additional female group leaders have been hired since 2011. In addition, IGB's next director will be a woman. These changes strongly redress the formerly extremely uneven gender balance at IGB.

18) *The IGB should increase efforts to prepare [...] **junior female scientists** specifically for scientific careers. [...] Parents' access to adequate childcare facilities should be supported.*

Measures taken to this end include: regular participation in Leibniz' mentoring programme for early-career female scientists, adoption of Leibniz' Cascade Model, allocation of institutional funds to support female staff members when returning to work from parental leave, a budget for targeted career development, assistance with finding appropriate child care, flexible working hours and home-office arrangements (cf. chapter 5).

Appendix 1

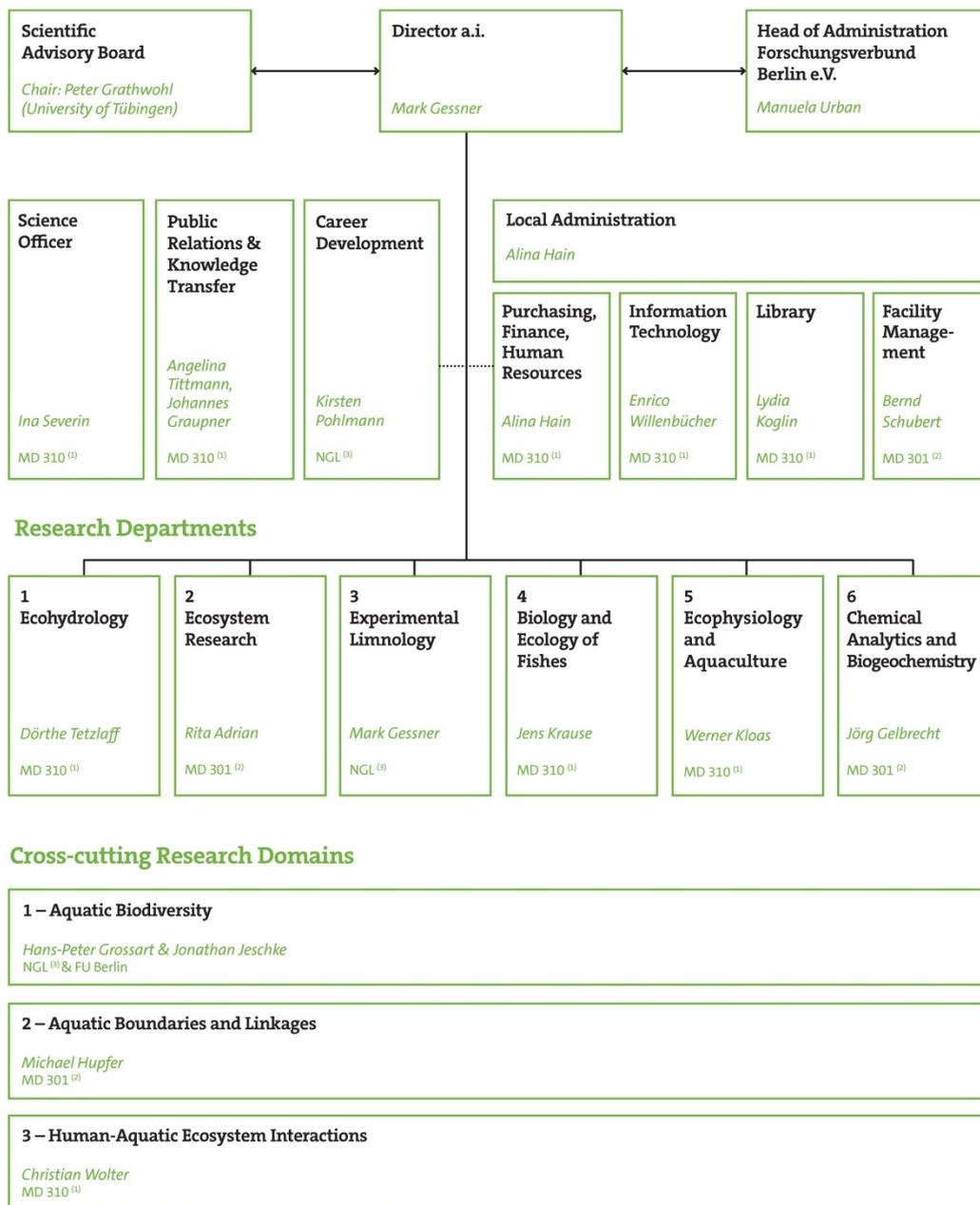
Organisational Chart



Structure

Leibniz-Institute of Freshwater Ecology and Inland Fisheries

Forschungsverbund Berlin e.V.



(1) MD 310: Müggelseedamm 310, Berlin (2) MD 301: Müggelseedamm 301, Berlin (3) NGL: Neuglobsow

Appendix 2

Publications and patents

	Period		
	2015	2016	2017
Total number of publications	298	351	342
Monographs	1	5	5
Individual contributions to edited volumes	14	21	15
Articles in peer-reviewed journals	231	273	273
Articles in other journals	20	31	32
Working and discussion papers	28	19	14
Editorship of edited volumes	4	2	3

Industrial property rights (2015-2017) ¹⁾	Granted	Registered
Patents	1	–
Other industrial property rights	–	–
Exploitation rights / licences (number)	–	

¹ Concerning financial expenditures for revenues from patents, other industrial property rights and licences see Appendix 3.

Appendix 3 Revenue and expenditure

Revenue		2015			2016			2017 ¹⁾		
		K€	% ²⁾	% ³⁾	K€	% ²⁾	% ³⁾	K€	% ²⁾	% ³⁾
Total revenue (sum of I., II. and III.; excluding DFG fees)		19,249.0			20,545.0			22,669.7		
I.	Revenue (sum of I.1., I.2. and I.3)	18,742.0	100 %		20,041.7	100 %		21,167.3	100 %	
1.	<u>INSTITUTIONAL FUNDING (EXCLUDING CONSTRUCTION PROJECTS AND ACQUISITION OF PROPERTY)</u>	13,176.0	70 %		13,293.0	66 %		13,523.5	64 %	
1.1	Institutional funding (excluding construction projects and acquisition of property) by Federal and <i>Länder</i> governments according to AV-WGL	13,176.0			13,293.0			13,523.5		
1.2	Institutional funding (excluding construction projects and acquisition of property) not received in accordance with AV-WGL	–			–			–		
2.	<u>REVENUE FROM PROJECT GRANTS</u>	5,566.0	30 %	100 %	6,748.7	34 %	100 %	7,643.8	36 %	100 %
2.1	DFG	1,671.0		30 %	1,552.5		23 %	1,678.7		22 %
2.2	Leibniz Competition	923.8		17 %	863.9		13 %	548.6		7 %
2.3	Federal, <i>Länder</i> governments	1,838.0		33 %	2,042.1		30 %	1,637.1		34 %
2.4	EU	756.3		14 %	1,371.1		20 %	1,917.8		25 %
2.5	Industry	44.0		1 %	5.8		0 %	–		–
2.6	Foundations	177.3		3 %	275.7		4 %	248.3		3 %
2.7	Other sponsors	155.3		3 %	637.6		9 %	613.3		8 %
3.	<u>REVENUE FROM SERVICES</u>	–	–		–	–		–	–	
3.1	Revenue from commissioned work	–			–			–		
3.2	Revenue from publications	–			–			–		
3.3	Revenue from exploitation of intellectual property for which the institution holds industrial property rights (patents, utility models etc.)	–			–			–		
3.4	Revenue from exploitation of intellectual property without industrial property rights	–			–			–		
II.	Miscellaneous revenue (e.g. membership fees, donations, rental income, funds drawn from reserves)	507.0			503.3			752.4		
III.	Revenue for construction projects (institutional funding by Federal and <i>Länder</i> governments, EU structural funds, etc.)	–			–			750.0 ⁴⁾		

Expenditures		T€		T€		T€	
Expenditures (excluding DFG fees)		19,076.7		19,806.7		21,200.5	
1.	Personnel	12,567.7		13,087.2		13,673.1	
2.	Material expenses	4,692.2		4,340.5		4,050.7	
2.1	<i>Proportion of these expenditures used for registering industrial property rights (patents, utility models etc.)</i>						
3.	Equipment investments	922.7		1,182.6		546.5	
4.	Construction projects, acquisition of property					132.5	
5.	Other operating expenses	503.0		569.6		585.1	
6.	Revenues of previous years carried forward	391.1		626.8		2,212.6 ⁵⁾	
DFG fees (if paid for the institution – 2.5% of revenue from institutional funding)		327.0		330.0		334.5	

¹⁾ Preliminary data: no

²⁾ Figures I.1, I.2 and I.3 add up to 100 %. The information requested here is thus the percentage of "Institutional funding (excluding construction projects and acquisition of property)" in relation to "Revenue from project grants" and "Revenue from services".

³⁾ Figures I.2.1 to I.2.7 add up to 100 %. The information requested here is thus the percentage of the various sources of "Revenue from project grants".

⁴⁾ Funds for new biodiversity building that will be shared with the Freie Universität Berlin on their campus in Berlin-Dahlem.

⁵⁾ Includes saved revenues for appointments of the new head of department 1 (2017) and the new director (2018).

Appendix 4

Staff

(Basic financing and third-party funding / proportion of women (as of: 31 December 2017))

<i>Please select appropriate and modify as necessary</i>	Full time equivalents		Employees		Female employees	
	Total	on third-party funding	Total	on temporary contracts	Total	on temporary contracts
	Number	Percent	Number	Percent	Number	Percent
Research and scientific services	117.6	54.0	143	74.1	52	80.8
Professors / Direct. (C4, W3 or equivalent)	4.0	–	4	–	1	–
Professors / Direct. (C3, W2, A16 or equivalent)	5.0	–	5	20.0	2	–
Academic staff in executive positions (E15)	4.0	–	4		1	–
Research group leaders (E14)	24.2	–	26	19.2	6	50.0
Scientists in non-executive positions (A13, A14, E13, E14 or equivalent)	51.5	74.4	61	93.4	27	85.2
Doctoral students (A13, E13, E13/2 or equivalent)	29.3	86.9	43	100.0	15	100.0
Service positions	66.8	14.7	75			
Laboratory (E9 to E12, upper-mid-level service)	30.5	21.4	34			
Laboratory (E3 to E8, mid-level service)	20.3	16.2	24			
Animal care (E5 to E8, mid-level service)	1.0	–	1			
Workshops (E5 to E8, mid-level service)	3.0	–	3			
Library (from E13, senior service)	1.0	–	1			
Library (E9 to E12, upper-mid-level service)	1.0	–	1			
Information technology - IT (E9 to E12, upper-mid-level service)	3.0	–	3			
Technical (large equipment, service) (E5 to E8, mid-level service)	5.0	–	6			
Department secretaries	2.0	–	2			
Administration	12.8	–	14			
Head of the administration	1.0	–	1			
Staff positions (E9 to E12, upper-mid-level service)	1.0	–	1			
Internal administration (financial administration, personnel etc.) (E9 to E12, upper-mid-level service)	6.0	–	6			
Building service (E1 to E4)	4.8	–	6			
Student assistants	5.9	53.3	20			
Trainees	3.0	–	3			
Scholarship recipients at the institution	17.0	94.1	17		10	
Doctoral students	7.0	100.0	7		5	
Post-doctoral researchers	7.0	85.7	7		4	
Other researchers	3.0	100.0	3		1	
Other doctoral students at the institution	17.0	58.8	17		6	
Doctoral students with external contracts	10.0	100.0	10		1	
Other doctoral students	7.0	–	7		5	

Annex B: Evaluation Report

Leibniz-Institute of Freshwater Ecology and Inland Fisheries,
Berlin (IGB)

Contents

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Appendix:

Members of review board and guests; representatives of collaborative partners

1. Summary and main recommendations

The Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB) employs an interdisciplinary approach to explore fundamental processes in inland waters. Its mission is to generate knowledge on the conservation and management of inland waters and to make it freely available.

Since the last evaluation, IGB has developed dynamically and has become one of the leading non-university institutions in the field of freshwater science. The topics and focus areas addressed in its departments and cross-cutting research domains are well chosen and topical. In some cases, staff and their work are to be found in the vanguard of research. In the last few years, IGB has wisely reinforced its base for both its own and collaborative experimental activities by starting to operate several state-of-the-art research infrastructures, like the LakeLab on Lake Stechlin. Since 2012, three of the six leadership positions at department level have been filled; at research group level, eight appointments have been made. IGB dealt with these changes efficiently.

Overall, this development has been reflected in a growing publication performance and visibility in the specialist disciplines represented at IGB. Interdisciplinary collaboration within the institute has increased since the last evaluation. IGB very appropriately combines public outreach and knowledge transfer. Third-party income has also developed positively. IGB's six departments are rated in each of two cases respectively as "good to very good", "very good" and "very good to excellent".

In 2016, after almost ten years in office, the highly-respected and meritorious director of the institute left IGB to become President of the Austrian Science Fund, FWF. Since then, the institute has been led on an interim basis by the head of the Experimental Limnology Department who has carried out both portfolios with remarkable dedication. It is welcomed, that, in the meantime, a renowned scientist from abroad has agreed to become Director of IGB.

IGB is connected to the universities in the Berlin-Brandenburg region by ten joint professorial appointments. Cooperation is diverse and very intensive. The institute is also involved in a raft of national and international collaborative projects.

IGB is fully committed to training junior researchers and participates in various graduate schools in the capital region. By actively recruiting female staff on the leadership level, the institute has improved gender equality and should continue to do so.

Special consideration should be given to the following main recommendations in the evaluation report (highlighted in **bold face** in the text):

General concept and profile (Chapter 2)

1. The combination of public outreach with knowledge and technology transfer in one unit has proved its worth. The so-called Science-Society Interface (SSI) does excellent work. In view of the wealth of tasks it encompasses, SSI's provision of human resources (three individuals) is limited. Also, a long-term key position is currently financed from third-party funds. It is recommended that IGB improves the situation.

2. The LakeLab at the Stechlin site is a very important infrastructure and, having become fully operational, now offers excellent conditions for work in the departments and the cross-cutting research domains as well as for a raft of collaborations. The LakeLab is currently working below its potential capacity. There is still room for further cooperation with external partners.
3. It is recommended to continue developing the principles on handling research data and to collate them in an institute-wide data management strategy. The objective should be to pool all related tasks in a core unit. This should be factored into proposed investments in IT.
4. The objective of IGB's strategic planning is to bring the individual disciplines at the institute closer together and sharpen perspectives across scales. To achieve this, the institute intends to reinforce analytics and the scientific infrastructures for collecting environmental data and is thus planning to apply for a permanent extraordinary item of expenditure of a scientific-strategic nature that contains three major investments and related staff.

The establishment of stable isotope analysis as well as IGB's envisaged investments in the further development of its field infrastructure on the basis of additional institutional funding are expressly endorsed, whereas the introduction of molecular biodiversity analysis is currently not endorsed.

Appropriateness of funding and facilities (Chapter 2)

5. IGB has kept pace with developments in the field, one of the points for which it was highly praised at the last evaluation. At the time, however, it was also noted that financial provisions were not keeping pace with the institute's scientific development. Even though individual measures have been introduced since then, this problem still essentially exists.

Furthermore, any growth in institutional funding in the last few years has been relativised by increases in costs (salaries, energy prices, water). As recommended in 2011, the institute must consult with its funders to find solutions for the existing problems. If necessary, further priorities must be set, as happened in the past, and caused the institute considerable distress. The costs of maintaining the research infrastructures, in particular, must be appropriately factored into IGB's strategic financial planning.

6. At present, IGB is accommodated at four sites. The resulting spatial distribution of staff poses a challenge for in-house communication. IGB should continue to keep an eye on this and, with the growing complexity, implement additional measures that ensure adequate communication between the sites.

Subdivisions of IGB (Chapter 3)

7. At the end of 2018, the head of Department 6 will retire. IGB should clarify well in advance how the department's work should be apportioned: service, research or – as has been so far – a combination of the two. This will determine how the leadership position will be designed and filled in the future.

Staff development and promotion of junior researchers (Chapter 5)

8. IGB should continue its efforts to achieve gender parity at the various levels of the institute hierarchy.
9. It is welcomed that IGB started to improve its doctoral programme in 2016. The general conditions now provide, amongst other things, for the creation of a three-person advisory committee and it is agreed that the partner universities in Berlin and Potsdam accept the credit points given for the courses at IGB. The revised rules now need to take effect. They should help to shorten what, in the past, was a very long doctoral period. It is positive that IGB employs a career development coordinator to support the programme.

2. General concept and profile

Development of the institution since the last evaluation

The Leibniz Institute of Freshwater Ecology and Inland Fisheries (IGB) studies fundamental processes in inland waters and the biotic communities that occur in them. It was last evaluated in 2011/2012. At the time, the process of renewal that IGB had undergone in the previous years was commended, not least for the very positive momentum it had triggered at the institute.

Since then, IGB has developed very well and has become one of the leading non-university institutions in the field of freshwater science. The topics and focus areas addressed in the six departments are very well-chosen; they are topical and internationally relevant, in some cases, staff and their work are to be found in the vanguard of research. Changes that have been introduced in the direction of certain areas are convincing. In particular, strongly reinforcing theoretical aspects and approaches, as recommended at the last evaluation, has been a convincing move. IGB boasts an impressive diversity of specialist disciplines ranging from hydrology, limnology, molecular and microbiology, ecology and fisheries biology through to environmental impact assessment. Combining research questions with application-related aspects functions very well at the institute.

The introduction of cross-cutting research domains (CCRD), which was already welcomed at the last evaluation, has further intensified the departments' interdisciplinary cooperation. This is reflected in the increasing number of jointly-prepared publications. Moreover, in the last few years, the CCRD have generated important impetus for IGB's work. With the arrival of the new director of the institute it is to be expected that they will benefit from new thematic stimuli.

Since 2012, the LakeLab in Stechlin was gradually put into service. It has made it possible to further extend the experimental work, which has become more and more important in freshwater science and ecology in the last few decades. IGB has thus taken a very visible step forward (see below and Chapter 3).

Much of the credit for the very positive development of the institute in general is due to the highly-respected and meritorious director of the institute who left IGB in 2016, after nearly ten years in office, to become President of the Austrian Science Fund, FWF. Since

then, the institute has been provisionally led by the head of the Experimental Limnology Department who has carried out both portfolios with remarkable dedication. It is welcomed, that, in the interim, a renowned scientist from abroad has accepted the position as Director of IGB.

At department level, three of the six leadership positions have been newly filled since the last evaluation; at research group level, eight new appointments have been made. The institute dealt with these staff changes efficiently and, in all cases, recruited distinguished researchers to work at the institute.

Results

In accordance with recommendations, IGB's publication performance has been significantly improved. Staff regularly publish their results in high-quality journals. It should also be seen as a major success that more than half of the publications derived from collaborations within the institute. Currently, however, a minority of IGB scientific staff accounts for most of the institute's publications. Hence, in the future, IGB should ensure that all scientific staff regularly contribute to its publication output.

It is welcomed that open access to publications plays a major role at IGB. Since the beginning of 2018, for example, Green Open Access has become mandatory. IGB also has an internal publication fund to support Gold Open Access according to set criteria.

The combination of public outreach with knowledge and technology transfer in one unit has proved its worth. The so-called Science-Society Interface (SSI) does excellent work. Employing what are in some cases newly-developed publication and dialogue formats, IGB very appropriately addresses social actors in politics, authorities and associations or engages in dialogue with them. With its topic-related products, such as Fact Sheets and Policy Briefs, IGB has elicited a remarkable response. **In view of the wealth of tasks it encompasses, SSI's provision of human resources (three individuals) is limited. Also, a long-term key position is currently financed from third-party funds. It is recommended that IGB improves the situation.**

As recommended, IGB intensified its efforts to organise and hold international scientific events.

IGB has excellent research infrastructures. The LakeLab at the Stechlin site, in particular, is an outstanding experimental facility of supra-regional relevance. **It is a very important infrastructure and, having become fully operational, now offers excellent conditions for work in the departments and the cross-cutting research domains as well as for a raft of collaborations. However, the LakeLab is currently working below its potential capacity. There is still room for further cooperation with external partners.** It is welcomed that, since 2017, the LakeLab has become part of AQUACOSM, a network of the leading European research infrastructures in the mesocosm field, financed by the EU and coordinated by IGB. Very good collaboration has already been established and the long-term plans to promote the network as infrastructure under European Strategy Forum on Research Infrastructures (ESFRI) should definitely be pursued.

Other important infrastructures IGB has acquired since the last evaluation include the telemetry system at Lake Döllnsee and the various measuring stations on Lakes Müggelsee, Stechlin, Arendsee and on the River Spree. The latter, in particular, serve to continuously collect a wealth of environmental parameters. The limnological longitudinal data collected in this way are highly relevant and contributed, for example, to the fifth Assessment Report of the Intergovernmental Panel on Climate Change. As recommended, IGB now uses its longitudinal data to derive research questions.

The management of the data IGB collects has been professionalised. In 2014, a data base manager was employed and in 2016, a Data Policy for environmental field data was adopted which provides for data storage in a central IGB data base. These developments are welcomed. At the same time, the departments are also taking on responsibility for related activities. **It is recommended to continue developing the principles on handling research data and to collate them in an institute-wide data management strategy. The objective should be to pool all related tasks in a core unit. This should be factored into proposed investments in IT.** It is positive that IGB places its research data at the disposal of international repositories.

Staff are active in numerous national and international bodies and thus contribute significantly to IGB's visibility.

Strategic work planning for the next few years

IGB's strategic planning logically follows on from its work to date. It particularly focuses on strengthening ecosystem and integrative approaches. **The objective is to bring the individual disciplines at the institute closer together and sharpen perspectives across scales. To achieve this, the institute intends to reinforce analytics and the scientific infrastructures for collecting environmental data and is thus planning to apply for a permanent extraordinary item of expenditure of a scientific-strategic nature that contains three major investments and related staff** (see Status Report, p. A-6ff.). In detail plans are assessed as follows:

Stable isotope analyses

Plans to establish a laboratory for analysing stable isotopes are convincing. The infrastructure will facilitate promising linkages within IGB (research groups, departments, CCRD): the institute can already draw on a raft of preliminary work that has so far been contracted out. For an institute with the range of activities being conducted at IGB, in-house isotope analysis is extremely important: moreover, the provision of analytics at IGB will result in convincing gains in efficiency and time, not least thanks to acquiring mobile devices for fieldwork. Special analytics are also of particular interest to external partners, including other Leibniz institutes. **The establishment of stable isotope analysis on the basis of additional financing from institutional funding is expressly endorsed.**

Development of field infrastructure

IGB has outstanding scientific infrastructures with which it continuously collects a wealth of the most diverse environmental data. The infrastructures constitute, furthermore, the basis for a remarkable number of national and international collaborations (see below

and Chapter 4). It is of the greatest strategic relevance to the institute to operate its field infrastructures at the highest level. **IGB's envisaged investments in the further development of its field infrastructure on the basis of additional institutional funding are expressly endorsed.**

Molecular biodiversity analyses

In the framework of the Berlin Center for Genomics in Biodiversity Research (BeGenDiv), IGB cooperates closely with FU Berlin. It is expected that the joint use of a new building on the FU Campus scheduled to begin in 2022, will further cement collaboration. Against this backdrop, IGB's plans to introduce mass spectrometric analytics for the molecular biological analysis of environmental samples on the FU Campus are convincing. They must, however, be minutely coordinated with FU Berlin which will also provide state-of-the-art sequencing technology. The option of sharing the use of relevant infrastructures at other sites should also be given greater consideration. Moreover, it must be clearly demonstrated how the institute as a whole would benefit from molecular biological analytics. **The introduction of molecular biodiversity analysis on the basis of additional institutional funding is currently not endorsed.**

Appropriateness of funding

Since the institute was founded, the ecological sciences have changed. Today, they rely much more on devices and analysis and are thus significantly more expensive than they were in the past. **IGB has kept pace with developments in the field, one of the points for which it was highly praised at the last evaluation. At the time, however, it was also noted that financial provisions were not keeping pace with the institute's scientific development. Even though individual measures have been introduced since then, this problem still essentially exists.**

Furthermore, any growth in institutional funding in the last few years has been relativised by increases in costs (salaries, energy prices, water). As recommended in 2011, the institute must consult with its funders to find solutions for the existing problems. If necessary, further priorities must be set, as happened in the past, and caused the institute considerable distress. The costs of maintaining the research infrastructures, in particular, must be appropriately factored into IGB's strategic financial planning.

IGB's third-party income has developed positively since the last evaluation. The institute achieves the desired ratio of one-third external funding to two-thirds institutional funding. This is appropriate. The institute was successful, above all, in acquiring funding from the Federation and the *Länder*, the DFG and the EU. Also, three members of staff managed to successfully acquire ERC grants since 2011. Moreover, nearly every year since then, the institute participated successfully in the Leibniz Competition. Overall, IGB has a balanced portfolio.

In 2017, IGB declared other revenue totalling approx. € 2.2 m (see Status Report, p. A-27, Appendix 3). Of that, € 1.2 m were earmarked for reappointments, both the director and the head of Department 1. A further €1 m are foreseen for building and renovation work (see below) which was not carried out in 2017. IGB is required to reduce the revenues

from institutional funding from the previous year carried forward to the following year (“überjährig verfügbare Selbstbewirtschaftungsmittel”) and limit them to the necessary minimum.

Appropriateness of facilities

In 2011, a shortage of space was diagnosed as one of IGB’s most urgent problems. The background to this was the institute’s rapid growth in the previous years. Since then, the institute has grown further and has been partially able to cover its needs, amongst others, by re-dedicating space at both the Lake Müggelsee and Stechlin site. It is positive that IGB’s ongoing need for space is being met in the medium term and that it will be able to use parts of a new building to be erected on the campus of FU Berlin from 2022. It is also welcomed that additional funding of approx. €1.5 m has been approved for renovating an old building at the Stechlin site in 2021. Both measures are important for improving IGB’s spatial provisions in the long term.

At present, IGB is accommodated at four sites (Lake Müggelsee (two buildings), Stechlin and Adlershof). **The resulting spatial distribution of staff poses a challenge for in-house communication. IGB should continue to keep an eye on this and, with the growing complexity, implement additional measures that ensure adequate communication between the sites.**

In 2011, it was noted that the reinforcement of theoretical and model-related research that was proposed at the time would have to go hand in hand with an extension of the IT infrastructure as well as the requisite human resources. In accordance with the recommendation, IGB increased its human resources in IT. It is welcomed that the funders have now provided the means for an urgently required major overhaul of IT infrastructure. To cover more extensive needs, such as mirroring and securing the environmental data IGB collects, cooperation with external partners should be expanded.

For human resources see Chapter 5.

3. Subdivisions of IGB

Department 1: Ecohydrology

[33.6 FTE, thereof 17.4 FTE Research and scientific services, 1 Post-doctoral fellow, 8.1 FTE Doctoral candidates, and 7.1 FTE Service staff]

Department 1 investigates ecohydrological mechanisms and processes of coupled aquatic and terrestrial ecosystems. The work focuses in particular on exchange processes between surface and sub-surface water bodies as well as hydraulic and hydrogeochemical interactions between lakes and their catchment areas.

Department 1 is currently at a stage of transition and thematic consolidation. The background to this is the appointment of a new head of department who assumed the position at IGB in 2017 and has since started setting her own points of emphasis. Other staff changes have also taken place at research group level in the last few years.

The department pools a diversity of interesting, innovative work, distinguishing itself by linking theoretical questions with quantitative measurements of relevant environmental parameters and novel, tracer-aided modelling approaches. Also, model-related work has been strengthened, as was recommended in 2011. It is positive that the new departmental leadership has begun to pool the various activities in two, well-chosen research focus areas. Following on from this, the aim should now be to bring them even closer together in the framework of a cross-departmental joint research focus.

Investigations in the field of Ecohydraulics are convincing. Work on nutrient balances and discharge in water catchment areas has generated clearly discernible results, amongst others in relation to phosphorus distribution in the landscape. In the context of this work, potential management options should receive greater consideration in the future. It would also be desirable to supplement the study examples, which currently tend to be regionally-based, by examples on national level and link the results with European experiences and policies.

The studies on the impact of artificial light in the night and its concomitant ecophysiological processes are innovative and have already culminated in outstanding transfer activities.

There are close, productive links with Department 2 as well as with the isotope-geochemistry activities in Department 6. Department 1 would benefit substantially from the planned establishment of a stable isotope facility. It is recommended to continue strengthening cooperation with partners like the Leibniz Centre for Agricultural Landscape Research (ZALF) and the Helmholtz Centre for Environmental Research (UFZ).

The research results of the last few years have been published appropriately. In the future, the groups should, however, exploit their potential to even greater effect. It is positive that third-party income is increasing; significant funds have been acquired from the DFG, the EU as well as the Federation and the *Länder*.

Department 1 is rated as “good to very good”.

Department 2: Ecosystem Research

[41.7 FTE, thereof 18.2 FTE Research and scientific services, 1 Post-doctoral fellow, 10.8 FTE Doctoral candidates, and 11.7 FTE Service staff]

Department 2 studies the interactions between the environment and the short- and long-term dynamics of aquatic communities. It also investigates the ecological and evolutionary processes influencing biodiversity and aquatic food-web interactions.

Under the leadership that has taken office in 2012, Department 2 has developed excellently. Three research group leaders were also appointed, and numerous postdoctoral research fellows have been integrated in the department. It is convincingly structured and cooperates closely with other groups at IGB. The three clusters (long-term observation, biodiversity and management strategies) are well chosen. Activities are characterised by coherence, focus and integration; the department’s work is located at the forefront of research. Moreover, it can boast a good balance between theoretical work and application-related aspects.

Activities in the field of long-term research link data analysis and modelling approaches in an effective way. On the basis of studies of short- and long-term variations in individual environmental indicators, interesting results have been produced on system-specific tipping points in lakes. This also applies for work on trophic interactions in lakes, which proved relevant in relation to climate change. The work presented in this context on parasites and invasive species is impressive.

Overall, the department has generated excellent data resources which it taps very effectively for new research questions. In the last few years, they have been coherently supplemented by further historical data sets. It is positive that many of the longitudinal indicators that have been collected are available as open data. On this basis, the department cooperates successfully with numerous partners and contributed, amongst others, to the latest report by the Intergovernmental Panel on Climate Change (IPCC).

Activities in the field of managing aquatic ecosystems, e.g. on the revitalisation of lakes or strategies for improving aquatic habitats, are highly relevant and have already produced very good results. They are also of great importance to other departments at IGB.

The issues addressed in biodiversity research are interesting and of high relevance. Research is conducted, for example, on the distribution of species, invasions and host-parasite interactions. Climate change and its impacts on aquatic communities plays an increasingly important role here, too. In addition, Department 2 cooperates closely with FU Berlin, particularly on taxonomic issues. These linkages will be further reinforced when the new building on FU's campus in Berlin-Dahlem is completed, as scheduled, in 2022, as four of the department's research groups will then be located there. At the same time, this will result in significantly greater demands for exchange between the groups. The departmental leadership should keep this well in mind.

The department's publication record is very good and contributes to its remarkable visibility. It has also continuously raised high revenues from third-party funding, including the DFG, the Federation and the *Länder*, the Leibniz Competition and the EU.

Department 2 is rated as "very good to excellent".

Department 3: Experimental Limnology

[39.7 FTE, thereof 15.4 FTE Research and scientific services, 1 Post-doctoral fellow, 8.9 FTE Doctoral candidates, and 14.4 FTE Service staff]

Department 3 studies the impact of global climate and environmental change on biodiversity and element turnover in aquatic communities and ecosystems. The objective is to acquire greater understanding of the behaviour of water bodies in the light of changing environmental conditions. To this end, field experiments are conducted and supplemented by laboratory experiments, analysis of long-term data series and theoretical modelling. This work demonstrates a convincing combination of theory, experiment and data collection as well as application aspects.

Central to the department's work is the LakeLab at the Stechlin site that has been developed and become fully operational since the last evaluation. The staff, including three new research group leaders, as well as the responsible technical group did an excellent job in

this context. This is particularly true of the head of department who has also done great service as interim director of IGB since 2016.

Once the LakeLab became fully operational, Department 3 embarked on first large-scale field experiments, amongst others on the impact of extreme storm events on lakes. To do so, the data collected in the field was correlated with historic longitudinal data, which led to interesting findings that were well published. All in all, the environmental data collected at the LakeLab are used very well and linked with current research questions or climate change issues. Further studies on light pollution and its impact on lake ecosystems have also been conducted. Work to date illustrates the LakeLab's high potential to implement experimental approaches to freshwater science; this potential should be even more extensively exploited in the future (see Chapter 2). To this end, the department is encouraged to employ its strong question-driven research even further.

With its work on the interaction and function of aquatic microbiota, especially on their genetic diversity, the department covers an interesting field ranging from the gene to the microcosm. At present, however, it is not yet clear how the transfer of insights can function across the various scales. Work should, therefore, be initially devoted to ecological functionality. Also, it is recommended to direct more attention to the various factors influencing the individual scale levels. By employing mathematical models, the theoretical foundations of the research work have been advanced; an appointment made in this field in 2017 will mean that existing potential will be exploited to yet greater effect in the future. In order to do so, however, IT must be significantly expanded, as it is already planned at the Stechlin site in the coming years (see Chapter 2).

Overall, since the appointment of the current head of department in 2011, Department 3 has developed very positively. The publication record is very good, particularly in view of the infrastructure activities the department conducts in parallel with great success. The number of joint publications with other researchers at IGB is high. Also, income from third-party funding has increased in the last few years with funds hailing in particular from the Federation and the *Länder*, the DFG and the Leibniz Competition.

Department 3 is rated as "very good".

Department 4: Biology and Ecology of Fishes

[34.9 FTE, thereof 18.6 FTE Research and scientific services, 3 Post-doctoral fellows, 3.3 FTE Doctoral candidates, and 10 FTE Service staff]

Department 4 investigates the ecological and evolutionary processes that structure freshwater fish communities and influence their function. Work focuses on the diverse interactions between natural, anthropogenic and socio-ecological factors, and their impact on fish populations. The objective is to improve the conservation and management of wild fish populations.

Since the last evaluation, Department 4 has continued to develop successfully. The three main research strands – fish behaviour, fisheries management and river revitalisation – complement each other very well. The department addresses issues of great relevance to

society. Special mention should be made, for example, of the long-term project to reintroduce the European Sturgeon. It is welcomed that the science-society and environmental-sociological component of the work has been strengthened further.

The basic research on studying fish behaviour (B-Types Project) is convincing. Recently, it was very well supplemented by model-based studies on dynamic interaction amongst fish species. The fish stock model, developed by the department, provides a differentiated basis for these activities. Furthermore, the telemetric system that has been installed since the last evaluation is an outstanding infrastructure for investigating the behaviour of fish in lakes.

The work on developing and managing fish stocks is extremely relevant. It currently focuses in particular on recreational fisheries in which the group is very visible. In view of the increasing scarcity of natural resources, fish management issues are likely to become significantly more important in the future. With this in mind, the department should seek to strengthen the socio-economic components in the framework of collaborations.

Department 4's publication performance is very good. As recommended, they are now publishing in top-ranked journals which allows the staff to enhance their visibility. Income from third-party funding has also been further increased. Significant funding stems from the Federation and the *Länder*, the DFG and the Leibniz Competition. The department is excellently connected, not least with international partners in the context of an academic exchange programme between HU Berlin and Princeton University, for example, the establishment of which was recommended in 2011. Contacts are also in place with MIT.

A particular feature of Department 4 are its strong public outreach and transfer activities, especially in the field of recreational fishing and angling. Results have been transferred to the angling community and also informed a policy document by the Food and Agriculture Organisation of the United Nations (FAO).

Department 4 is rated as "very good to excellent".

Department 5: Ecophysiology and Aquaculture

[24.7 FTE, thereof 11.5 FTE Research and scientific services, 1.5 Post-doctoral fellows, 3.2 FTE Doctoral candidates, and 8.5 FTE Service staff]

Department 5 investigates natural and anthropogenic environmental factors and their impact on aquatic vertebrates. The objective is to generate fundamental knowledge on the ecophysiology of the fishes and amphibians studied as well as on ecotoxicology and sustainably operated aquaculture.

The department addresses relevant topics which it handles with great engagement. Department 5 thus covers a wide spectrum of diverse, meaningfully-related research questions. All in all, its work has produced discernible and interesting results. Since the last evaluation, the department in general has developed positively, not least because it integrated a raft of different actors.

The field of ecophysiology/ecotoxicology of fishes and amphibians has produced convincing results. The ecotoxicological stressors studied are well chosen. They are coherently linked with physiological issues such as animal development and nutrition, reproduction

and animal welfare. On these research questions there are linkages to Department 4, which have been strengthened in line with recommendations by having one person working part time in both departments simultaneously. Cooperation is also obvious in the projects to reintroduce the Sturgeon. Clearly, these existing linkages should be expanded further.

With its work on aquaculture, the department is active in a field of international importance, the relevance of which is likely to increase in the future. It is welcomed that, as recommended, the topic has become an IGB focus in the last few years. The work is very visible. One highlight is the patented aquaponics system which combines techniques of fish breeding with crop cultivation; the relevant technology is currently being refined in demonstration facilities. IGB should strengthen the department both in the technical and laboratory areas.

The department's publication record is in total very good. Staff also provide valuable consultancy. The third-party funding income is very good, too, the major funders being the Federation and the *Länder* and the DFG. As recommended, the department acquired additional European funding and assumed the leadership in several large-scale EU projects.

Department 5 is rated as "very good".

Department 6: Chemical Analytics and Biogeochemistry

[15.5 FTE, thereof 5.8 FTE Research and scientific services, 2.2 FTE Doctoral candidates, and 7.5 FTE Service staff]

Department 6 carries out fundamental service functions in the field of chemical analysis for the entire institute and maintains IGB's long-term water quality programmes. It conducts this work with dedication and a high level of expertise. Staff are closely integrated in the various project phases and cooperation with IGB's departments is remarkably good. It is also positive that the department has focused not only on improving existing analytical methods, measurement protocols and testing methods but also on implementing new ones. These activities are very important and make a crucial contribution to the quality of analytics at IGB. The department can draw on extensive technical and analytical facilities.

The services provided by the department are underpinned by its own research activities which focus, in particular, on biogeochemical processes and cycling of elements and compounds in freshwater ecosystems. Overall, convincing work has been produced, for example on the diagenetic processes in lake sediments, carbon fluxes in wetlands and greenhouse gas emissions, which has also been adequately published. Third-party funding is appropriate. The addition of further human resources in the field of isotope biogeochemistry has proven successful and creates a good basis for IGB's strategic planning (see Chapter 2).

Department 6 is rated as "good to very good".

At the end of 2018, the head of Department 6 will retire. IGB should clarify well in advance how the department's work should be apportioned: service, research or – as has been so far – a combination of the two. This will determine how the leadership position will be designed and filled in the future.

4. Collaboration and networking

Collaboration with universities

IGB is closely connected with the universities in the Berlin-Brandenburg region. Ten joint professorships link the institute with Freie Universität Berlin (FU), Humboldt-Universität zu Berlin (HU), Technische Universität Berlin (TU) and the University of Potsdam (UP). Six of these professors have been newly appointed since the last evaluation, including one Heisenberg Professor. It is convincing that IGB would like to intensify the existing connections and is looking to establish two further joint appointments. The relevant plans are welcomed.

IGB's cooperation with university partners in research, the use of infrastructure and supervision of junior researchers is extremely fruitful (see Chapter 5). Staff contribute to academic teaching, amongst other things in the international Master's programme at HU Berlin, "Fisheries Science and Aquaculture", which is substantially supported by IGB. The institute's participation in two applications for excellence clusters in the current round of the Excellence Strategy, one led by HU and TU Berlin and another coordinated by the University of Constance, reflects its relevance and institutional prestige.

IGB is involved in a remarkably large number of the most diverse research consortia. Already at the last evaluation, the institute's engagement in founding the Berlin Center for Genomics in Biodiversity Research (BeGenDiv) was commended. It is also involved in the Berlin-Brandenburg Institute of Advanced Biodiversity Research (BBIB), another strategically-significant research initiative. Amongst other collaborative projects of importance to IGB are the Integrative Research Institute on Transformations of Human-Environment Systems at HU Berlin (IRI ThESyS) and SFB 1704 (DynaTrait), which is based at the University of Potsdam.

Collaboration with other domestic and international institutions

IGB is involved in many national, European and international collaborative projects in the framework of which it cooperates closely and productively with different institutions, including partners in industry. In this context, IGB is a visible, coveted partner thanks both to its expertise and the scientific infrastructures the institute provides. Since 2017, IGB has been coordinating a Europe-wide network, AQUACOSM, which aims to link marine and freshwater experimental research platforms. This provides for opportunities to further strengthen collaborations (see Chapter 2).

Within the Leibniz Association, too, IGB has very good institutional linkages and cooperates with other institutions, such as the three Leibniz research alliances. The research alliance on "Light Pollution" is coordinated by IGB.

IGB is an attractive institute for visiting researchers. Its exchange programme, which has been operating since 2009, has proven most valuable and led to a significant increase in the number of visiting researchers in comparison with the figures at the last evaluation. It can also be rated as a success that many fellows have come to IGB, supported, amongst others, by the Humboldt Foundation and the DAAD.

Other collaborations and networks

It is positive that IGB has continued to expand its activities at the intersection of research and policy. Participating in projects involving not only academic but also non-academic actors, such as associations, private companies and practitioners, is a very promising way of transferring results to socially relevant areas outside academia as well (see Chapter 3).

It is welcomed that IGB has participated in a raft of strategic initiatives in the last few years, for example the national Water Science Alliance and the global Alliance for Freshwater Life. Such engagement is extremely important for the field.

5. Staff development and promotion of junior researchers

Staff development and personnel structure

IGB's personnel structure is appropriate for its current portfolio. On the reporting date (31.12.2017), 235 individuals were employed at the institute, 60 per cent in "Research and scientific services" and almost 30 per cent in "Services". In comparison with the reporting date for the last evaluation (end of 2010), there are 35 additional staffing positions, most of them third-party funded.

In 2011, the Review Board made specific recommendations on appointments and IGB meaningfully adopted them. An additional member of staff was given the opportunity, for instance, to be trained to operate the institute's research vessel. This training has not, however, yet been completed. Some positions, amongst others in metabolic physiology, have not been filled under the interim leadership, a decision which is understandable. The requisite decisions should be taken when the new IGB director has assumed office.

IGB has created convincing general conditions for promoting its staff (Human Resource Strategy, Human Resource Development Guidelines). In 2015, the institute was granted the "HR Excellence in Research" seal for its HR policy and improvements in working conditions.

Promotion of gender equality and work-family balance

On the reporting date (31.12.2017), the share of women employed in "Research and Scientific Services" at IGB was 36 per cent. It has roughly stayed at the same level since the last evaluation.

IGB did, however, achieve visible improvements at the level of leadership positions, none of which was held by a woman in 2011. Now, two of the six departments are led by female researchers. Similarly, on the reporting date, three of the ten professorships were held by women. The newly-appointed director of the institute is also female. **IGB should continue its efforts to achieve gender parity at the various levels of the institute hierarchy.**

Measures for assuring the balance between work and family life have been specifically updated in the last few years and tailored to staff needs. They are part of IGB's Human Resource Strategy (see above) and thus firmly rooted in the institute's strategic guidelines. In accordance with the Leibniz Association's objectives, IGB should have these measures and achievements certified in an auditing procedure.

Promotion of junior researchers

Training junior researchers is a high priority at the institute. At the end of 2017, more than 60 doctoral candidates were employed at IGB, seven of whom on fellowships. A further 17 with contracts at other institutions were supervised by the institute.

It is welcomed that IGB started to improve its doctoral programme in 2016: The general conditions provide, amongst other things, for the creation of a three-person advisory committee and it is agreed that the partner universities in Berlin and Potsdam accept the credit points given for the courses at IGB. The revised rules now need to take effect. They should help to shorten what, in the past, was a very long doctoral period. It is positive that IGB employs a career development coordinator to support the programme. Also, doctoral candidates would benefit from an even closer practical supervision provided by postdocs.

IGB's doctoral candidates are integrated in various graduate schools which are, however, organised differently. The suggestions that have been made by the institute's university partners to create a unified set of general conditions in the framework of the Berlin University Alliance (HU, TU, FU and Charité) should be pursued. This would have positive consequences for IGB's doctoral candidates.

IGB is an attractive employer for junior researchers. As of 2015, it increased its activities to promote postdocs by introducing a skill-development programme for this target group. It is welcomed that IGB is engaging with this increasingly important area and offering postdocs individually tailored career paths. Nonetheless, postdocs could receive more encouragement to become independent, e.g. by independent publishing at an advanced stage.

Vocational training for non-academic staff

IGB offers all the status groups at the institute appropriate opportunities to extend their qualifications and pursue further training. It regularly provides three traineeships for office managers as well as laboratory technicians.

6. Quality assurance

Internal quality management

IGB uses the internal quality management tools that are typical for Leibniz institutions. Quality assurance and quality control of laboratory analyses and field sensors is based on DIN or ISO standards; analytical methods are calibrated according to certified standards.

In principle, IGB employs performance-based funding allocation (LOM). However, for this purpose, only approx. €200k are earmarked annually which, in 2017, equalled approx. 1.5 per cent of the institute's institutional funding. In the medium term, IGB should increase the volume of performance-based funding allocation. On top of this, IGB should examine the stipulation that only 60 per cent of its LOM-funds is allocated based on performance as this contradicts the essence of LOM.

Quality management by the Scientific Advisory Board and Supervisory Board

In accordance with its statutory mission, the Scientific Advisory Board contributed successfully to institutional quality management. As requested by the Senate, it completed an audit in 2015.

Implementation of recommendations from the last external evaluation

IGB successfully addressed the recommendations made by the Leibniz Association Senate in 2012 (see status report, p. A-20f). The recommendations on institutional funding (Recommendation 8) and human resources (Recommendations 13 and 16) still apply.

Appendix

1. Review board

Chair (Member of the Leibniz Senate Evaluation Committee)

Nicola Fohrer Institute for Natural Resource Conservation, Department of Hydrology and Water Resources Management, Kiel University

Deputy Chair (Member of the Leibniz Senate Evaluation Committee)

Konrad Fiedler Department of Botany and Biodiversity Research, Division of Tropical Ecology and Animal Biodiversity, University of Vienna

Reviewers

Steven Bouillon Division of Soil and Water Management, KU Leuven, Belgium

Karl-Heinz Feger Institute of Site Ecology and Plant Nutrition, Technische Universität Dresden

Anna Gårdmark Department of Aquatic Resources, Swedish University of Agricultural Sciences, Öregrund, Sweden

Jürgen Geist Aquatic Systems Biology, Technical University of Munich

Helmut Hillebrand Institute for Chemistry and Biology of the Marine Environment, University of Oldenburg

Patricia Holm Program MSE, University of Basel, Switzerland

Lea Kauppi Finnish Environment Institute, Helsinki, Finland

Jakob Pernthaler Department of Plant and Microbial Biology, Limnological Station, University of Zürich

Helmut Wedekind Bavarian State Research Center for Agriculture, Institute for Fisheries, Starnberg

Representative of the Federal Government

Roland Krüppel Federal Ministry of Education and Research, Bonn

Representative of the Länder Governments (Member of the Leibniz Senate Evaluation Committee)

Marc Brüser Ministry of Science, Further Education and Culture of Rhineland-Palatinate, Mainz

2. Guests

Representative of the relevant Federal government department

absent with apologies

Federal Ministry of Education and Research, Bonn

Representative of the relevant Land government department

Björn Maul

The Governing Mayor of Berlin, Senate Chancellery – Science and Research

Representative of the Scientific Advisory Board

Peter Grathwohl

Hydrogeochemistry, University of Tübingen

Representative of the Leibniz Association

Ulrich Bathmann

Leibniz Institute for Baltic Sea Research, Warnemünde

3. Representatives of collaborative partners (one-hour interview)

Peter A. Frensch

Vice President for Research, Humboldt-Universität zu Berlin

Brigitta Schütt

Vice President, Freie Universität Berlin

Christine Ahrend

Vice President for Research, Faculty Appointment Matters and Promotion of Young Scientists, Technische Universität Berlin

Robert Seckler

Vice President for Research and Junior Academics, University of Potsdam

Jens Rolff

Director Institute of Biology, Freie Universität Berlin

18 December 2018

Annex C: Statement of the Institution on the Evaluation Report

**Leibniz-Institute of Freshwater Ecology and Inland Fisheries,
Berlin (IGB)**

We are grateful for the opportunity to comment on the very positive report of the evaluation committee that recognizes IGB's dynamic development over the past seven years, with great advances made on all fronts. Thanks are due to the chair, co-chair and the other members of the committee as well as to the evaluation office of the Leibniz Association for ensuring a thorough, efficient, smooth, critical and invariably constructive evaluation process.

Highlights are the acknowledgement of IGB's excellent publication performance since the last evaluation, which is now on par with the very best worldwide in terms of both quality and quantity, and of the strong collaborative research within and beyond the institute, which has led to tangible outputs in a wealth of joint publications. We are also delighted to ascertain that the evaluation committee shares our view about the importance of public outreach and knowledge transfer. Effective communication and exchange with stakeholders and the greater public is indeed an important aspect of IGB's activities. We would like to emphasize, however, that the innovative steps which were taken at IGB to reach out beyond the scientific community, and which kindled the committee's excitement, can only bear fruit if they are rooted in solid academic advances as made by IGB in freshwater science, a field that in general has greatly developed in recent years.

As is correctly stated in the report of the evaluation committee, the publication output of individual scientists at IGB follows a skewed distribution. This skewness is primarily due to the long tail caused by a quarter of IGB's staff scientists (i.e. tenured or tenure-track scientific staff) publishing 10 or more papers in leading peer-reviewed journals (2017 taken as a reference year). Importantly, however, the median number of articles published by staff scientists this same year in journals listed in the Web of Science was five, indicating that IGB's performance was collectively accomplished by a majority of scientists. Recognizing that there is always scope for improvement, we will nevertheless continue working towards mobilizing the full potential of IGB's academic staff and departments in the future.

IGB shares the committee's assessment of the opportunities offered, and the challenges posed, by the rapidly growing volume of data from (i) long-term field records, (ii) high-resolution measurements made in space and time during large-scale experiments in IGB's unique field infrastructure, and (iii) high sample throughput, including by next-generation sequencing. We acknowledge the support expressed for the field facilities, particularly for IGB's LakeLab, and for a professional technical and scientific workforce and ingenuity to handle the rapidly growing amounts of data. Although the director's position at IGB has not yet been filled, it is clear that managing the sharply increased data volumes and seizing opportunities for gaining new insights on freshwater systems inferred from these data must be a priority for IGB in the years to come.

We are excited about the strong support received from the evaluation committee for establishing a stable-isotope facility and for strengthening IGB's field infrastructure. However, we regret the hesitation also to endorse the envisaged boost in automated high-throughput sequencing pipelines and sequence analyses, which we consider vital in the future, independent of the inauguration of the new biodiversity building shared with the FU Berlin and the specific research profile of the new IGB director. Molecular methods are essential tools

to unravel the secrets of life and have hence pervaded all areas of biology. This includes a very wide range of research topics addressed at IGB – from analyses of microbial community structure to the genetic basis of behavioural traits and responses to stressors. These methods already play a central role at IGB and are often used on a routine basis. Given their potential, there is yet large scope for future developments. While these will be closely coordinated with IGB's cooperation partners in the BeGenDiv and beyond, it is clear that IGB must bring its own important contributions to these partnerships in terms of both investments and personnel.

We also appreciate that the evaluation committee recognized the substantial progress made at IGB in recent years to improve numerous important governance aspects. This includes our general HR strategy, the promotion of junior researchers, internationalization and effective in-house communication. A particular success in our view is the appointment of women to both department head positions that opened since the last evaluation in 2011, valuing our efforts to redress the previously extreme gender imbalance at the leadership level. As recommended in the report of the evaluation committee, we will continue investing in good governance and being attentive to gender imbalances at all levels.

In conclusion, we appreciate the analyses and recommendations of the evaluation committee, which provide an excellent basis for the institute to progress on its dynamic trajectory to impact both science and society. Particularly important is the support of IGB's strategic direction towards further integration of the disciplines represented at the institute. These recommendations will help the leadership of the institute in setting priorities and discussing needs with IGB's governing bodies. Several processes have already been initiated.