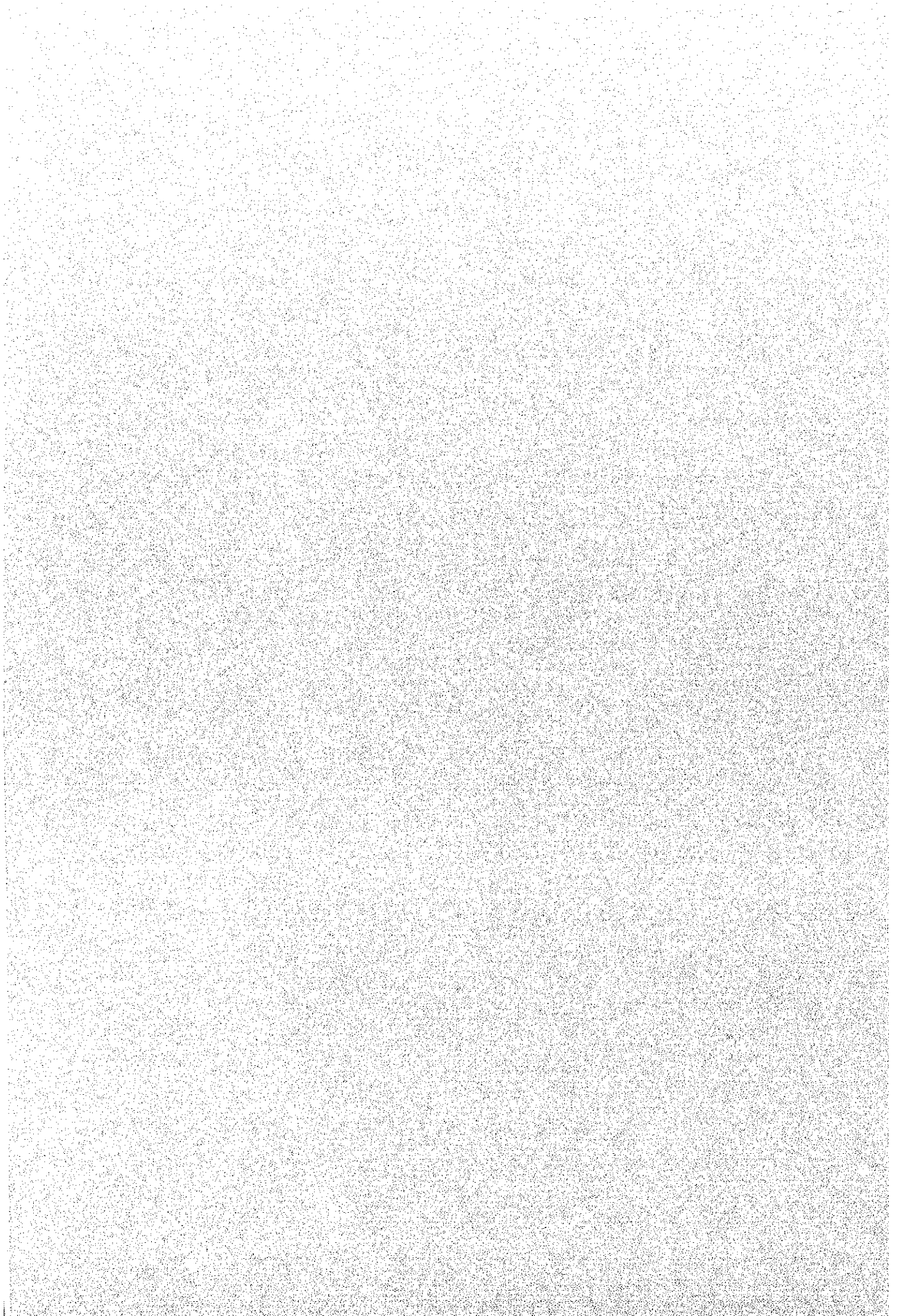
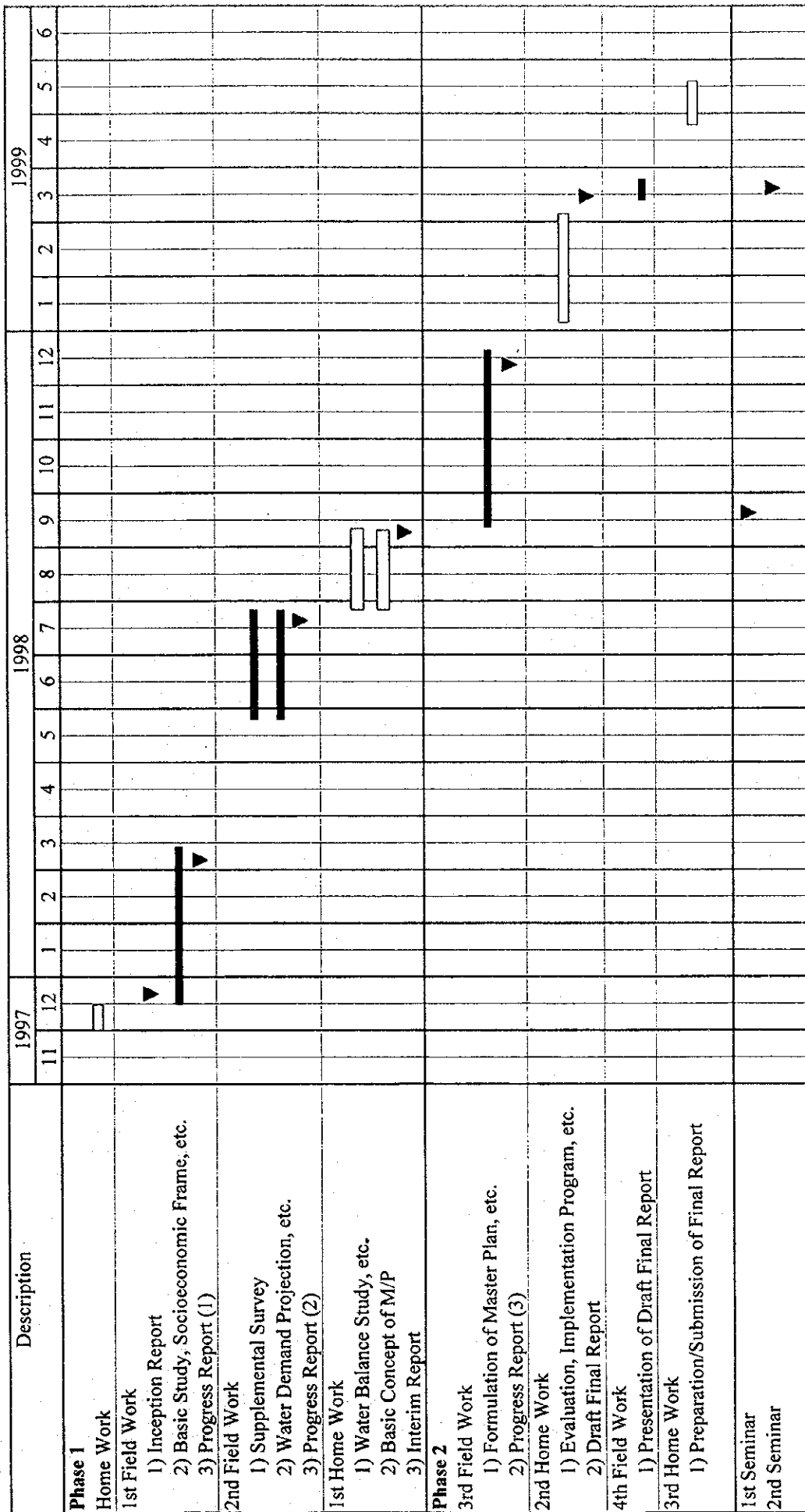


付 図







Legend :  Home Work in Japan  Field Work in Macedonia

图 1 全体工程

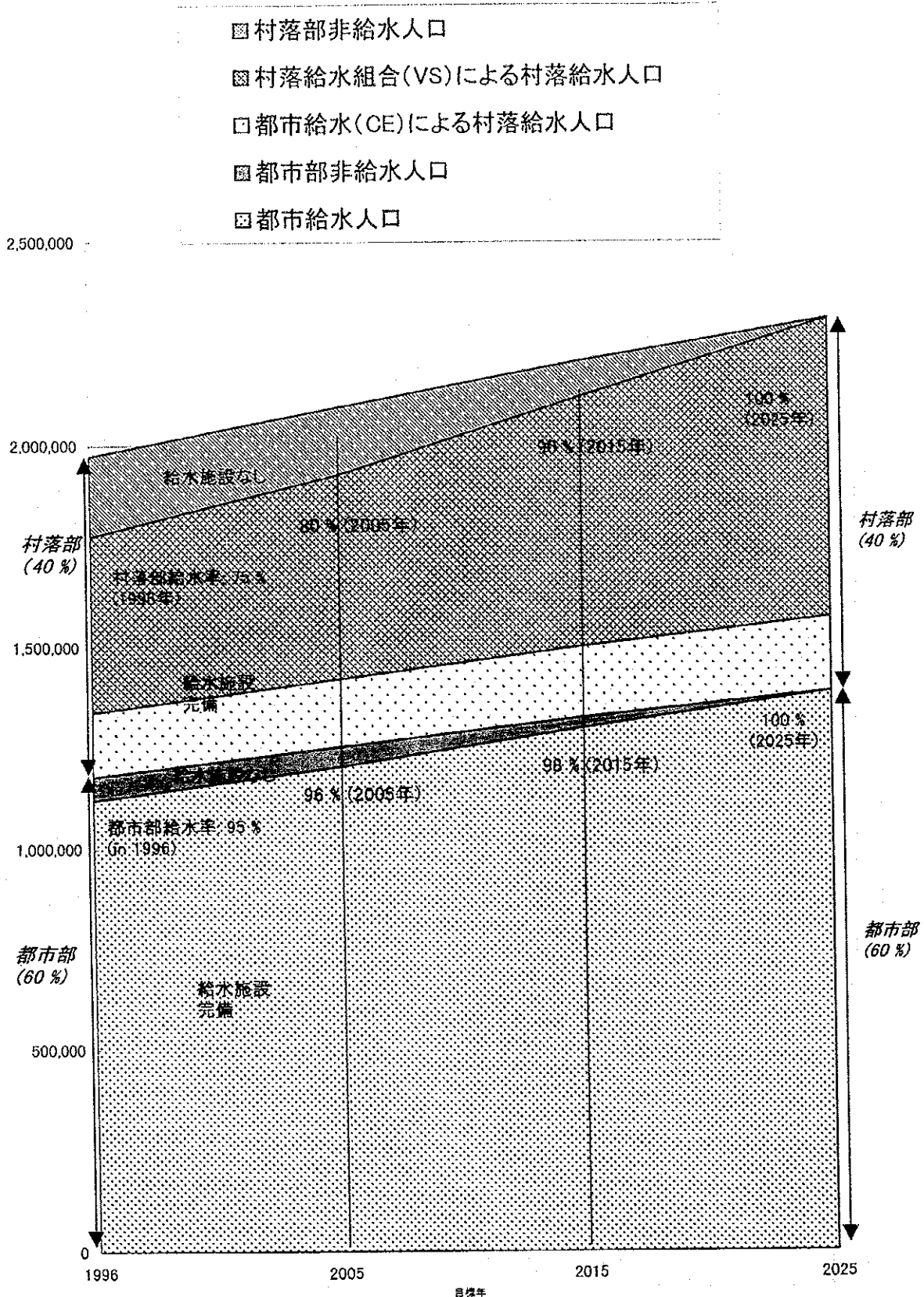


図 2 開発曲線 (生活用水)

THE STUDY ON THE INTEGRATED WATER RESOURCES
 DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
 THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
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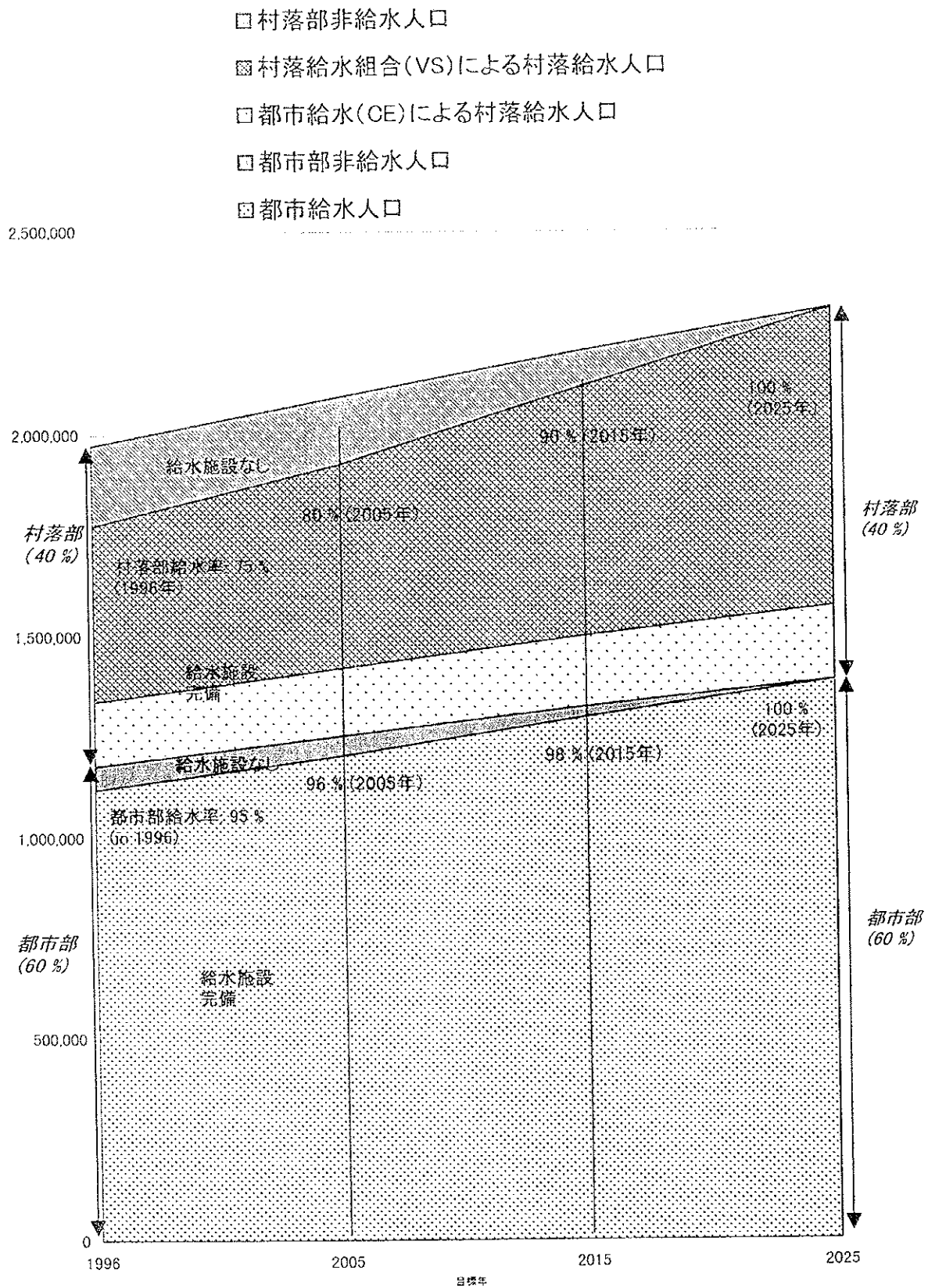


図 2 開発曲線 (生活用水)

THE STUDY ON THE INTEGRATED WATER RESOURCES
 DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
 THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
 JAPAN INTERNATIONAL COOPERATION AGENCY

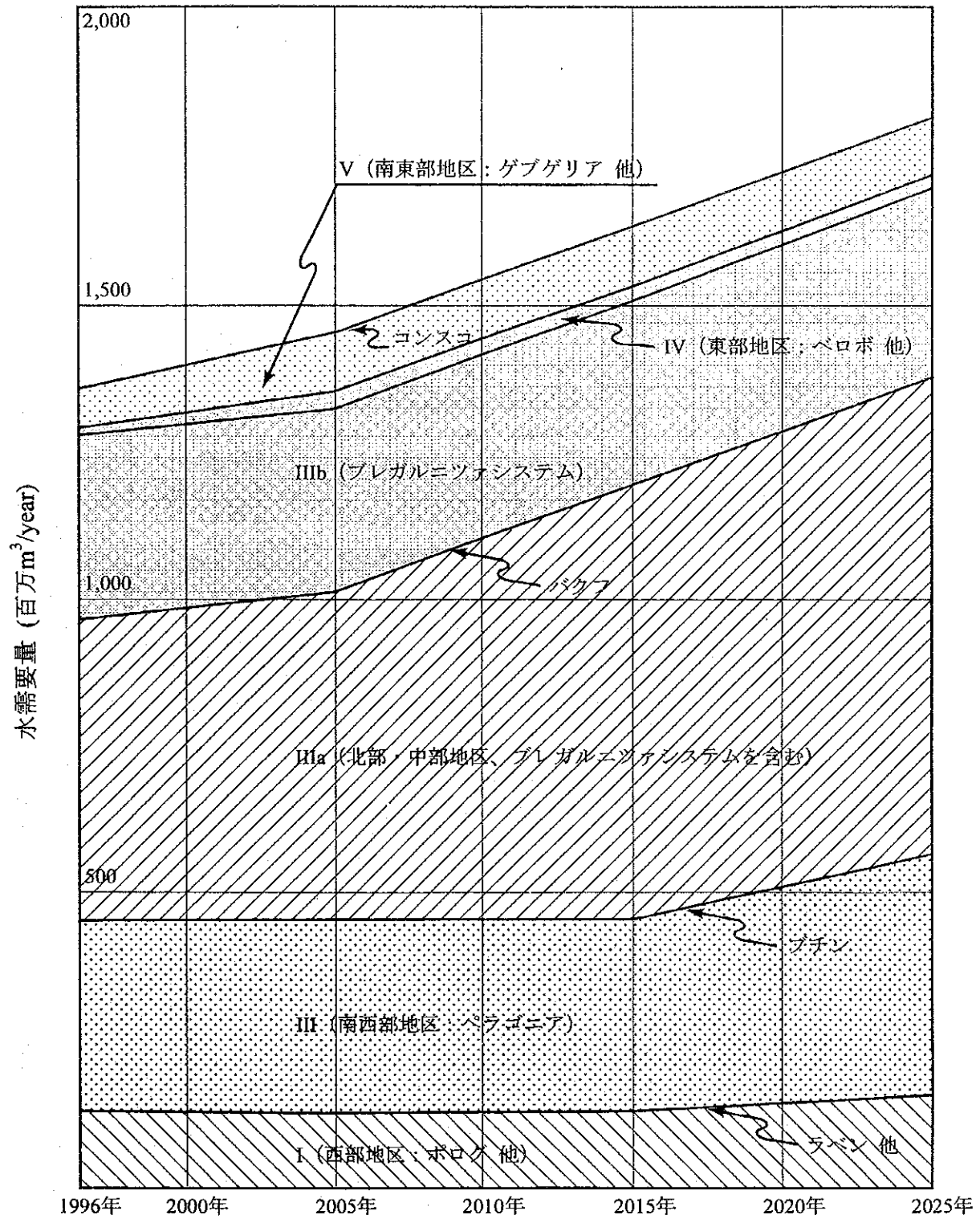


図 3 開発曲線 (灌漑用水)

THE STUDY ON THE INTEGRATED WATER RESOURCES
DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

JAPAN INTERNATIONAL COOPERATION AGENCY

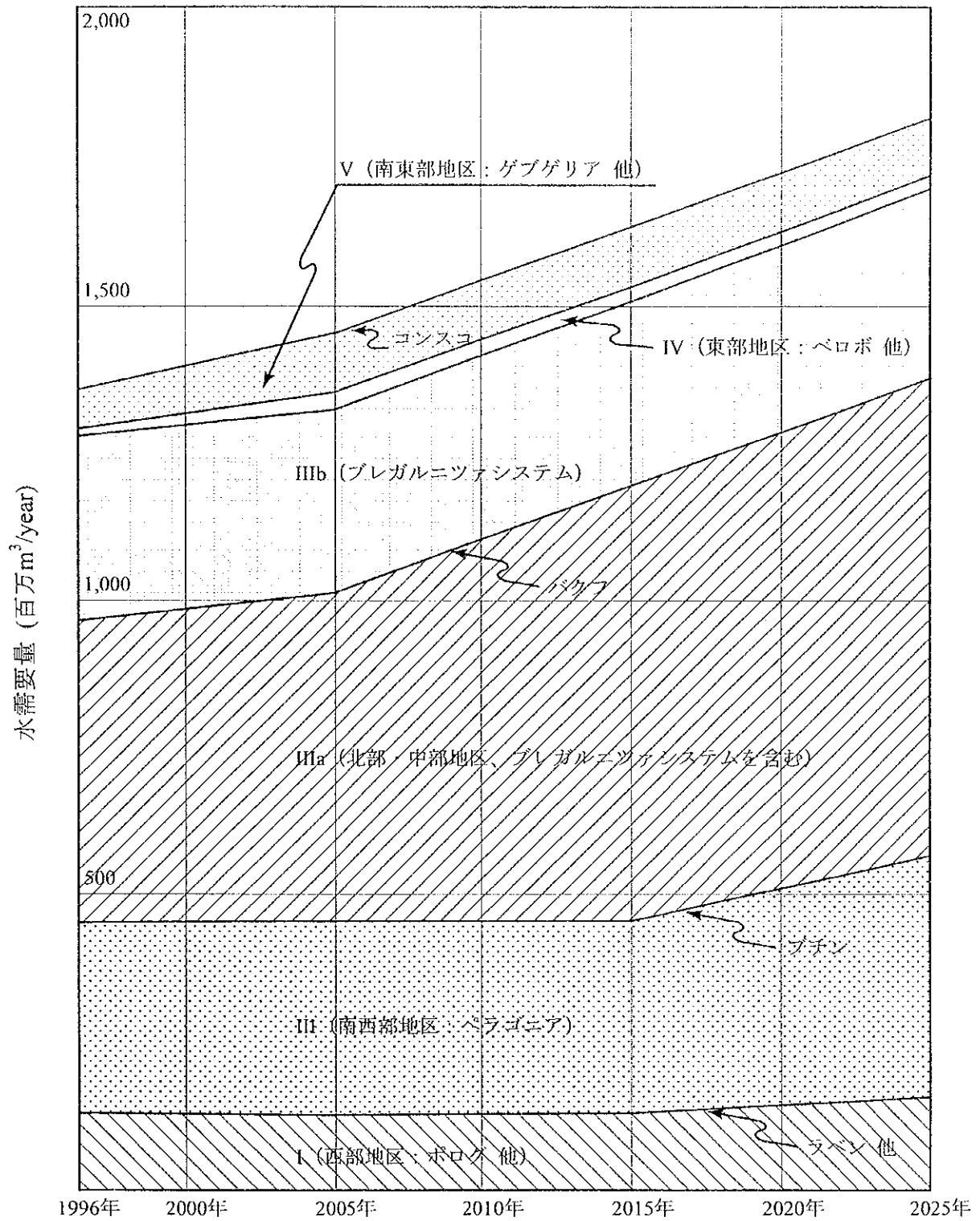


図 3 開発曲線 (灌漑用水)

THE STUDY ON THE INTEGRATED WATER RESOURCES
DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA

JAPAN INTERNATIONAL COOPERATION AGENCY

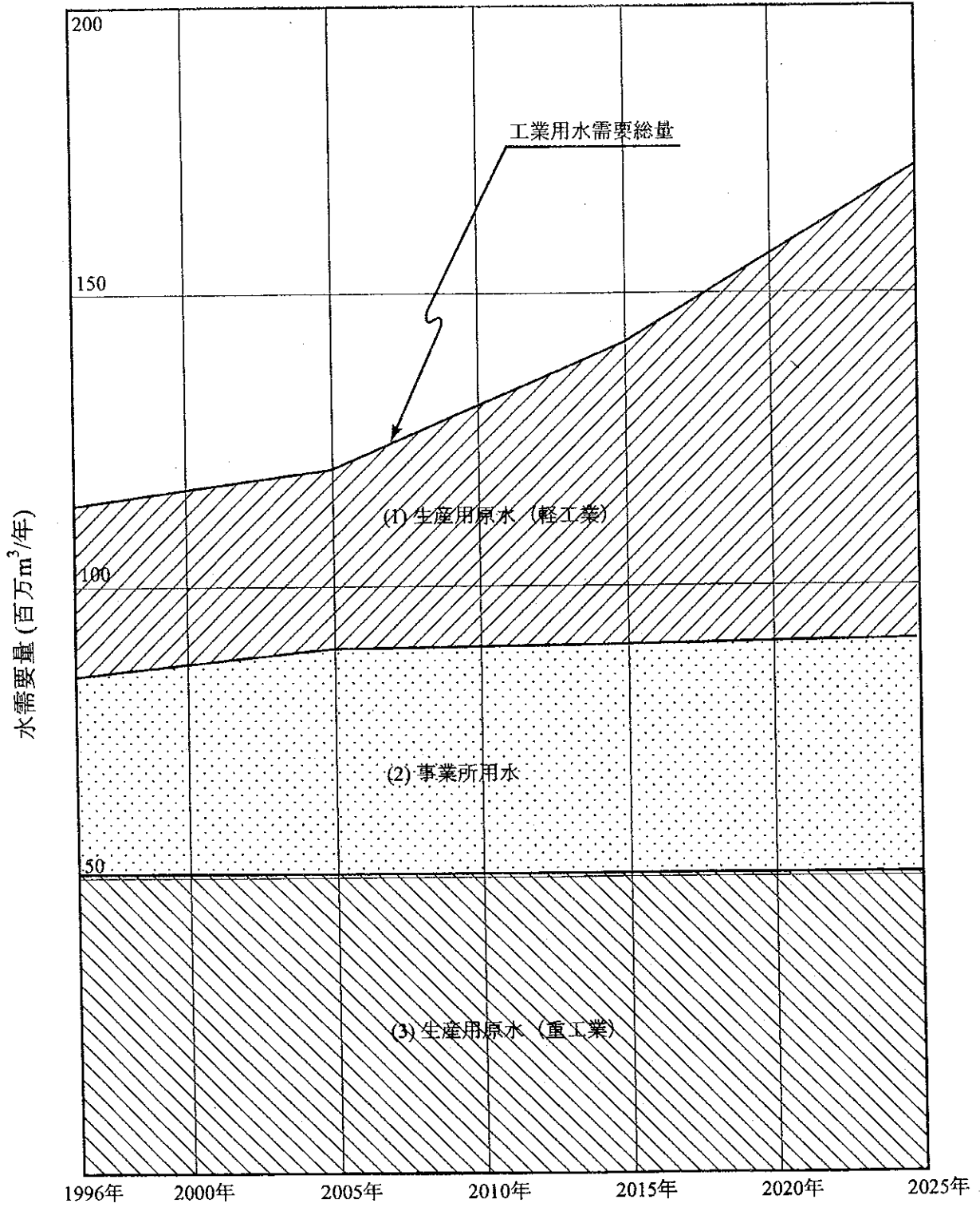


図 4 開発曲線 (工業用水)

THE STUDY ON THE INTEGRATED WATER RESOURCES
 DEVELOPMENT AND MANAGEMENT MASTER PLAN IN
 THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
 JAPAN INTERNATIONAL COOPERATION AGENCY

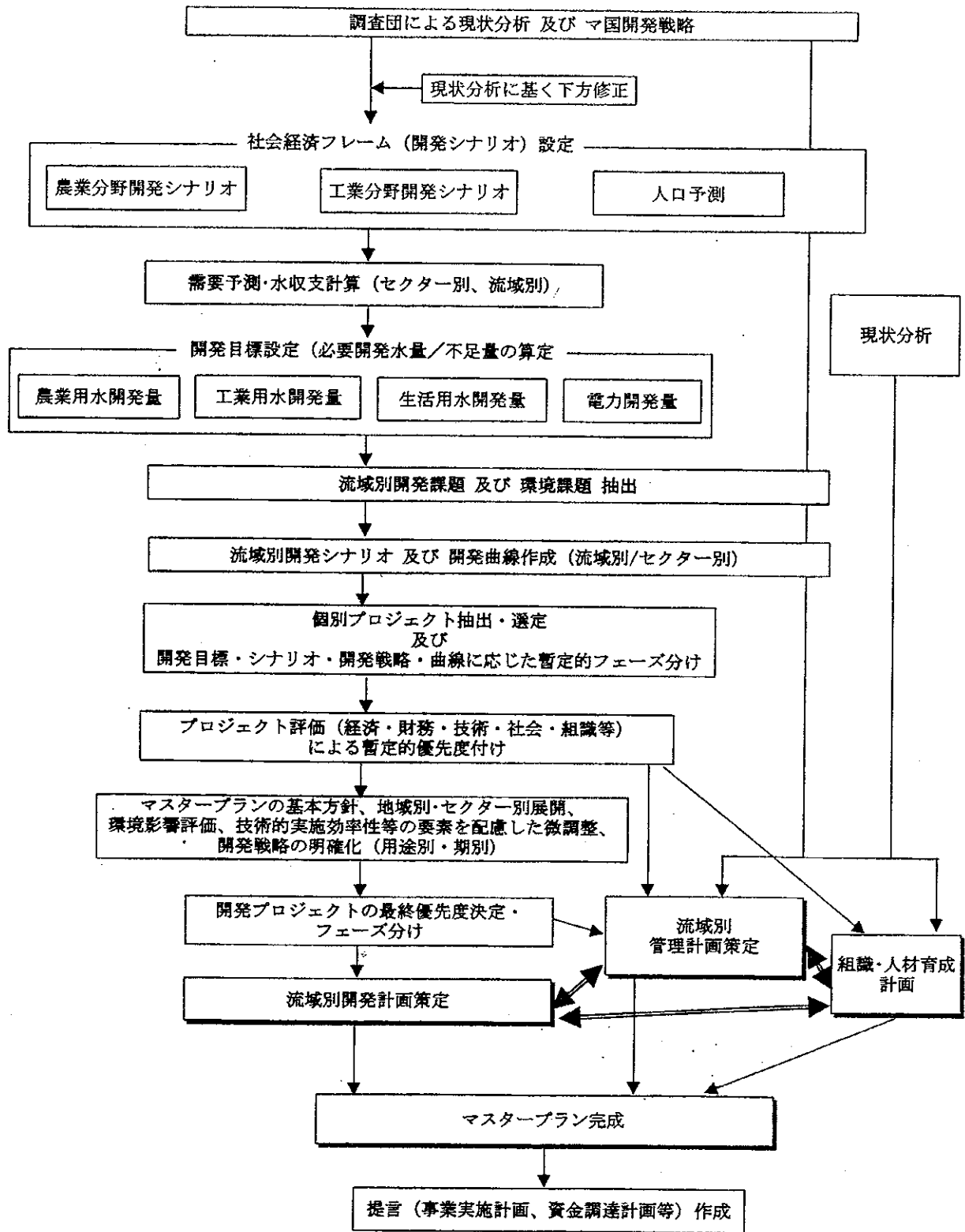


図 5 マスタープラン策定手順

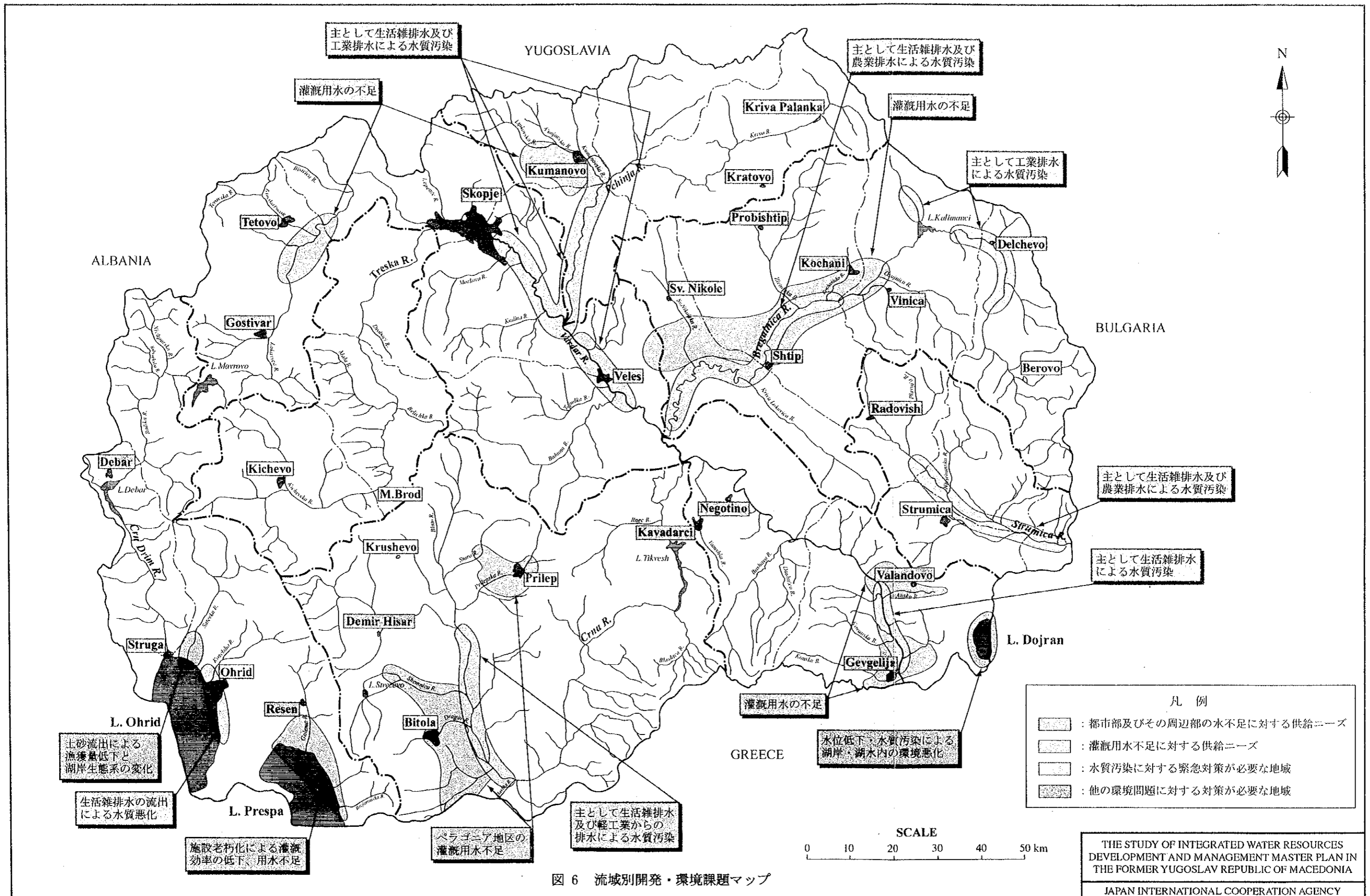


図 6 流域別開発・環境課題マップ

THE STUDY OF INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT MASTER PLAN IN THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
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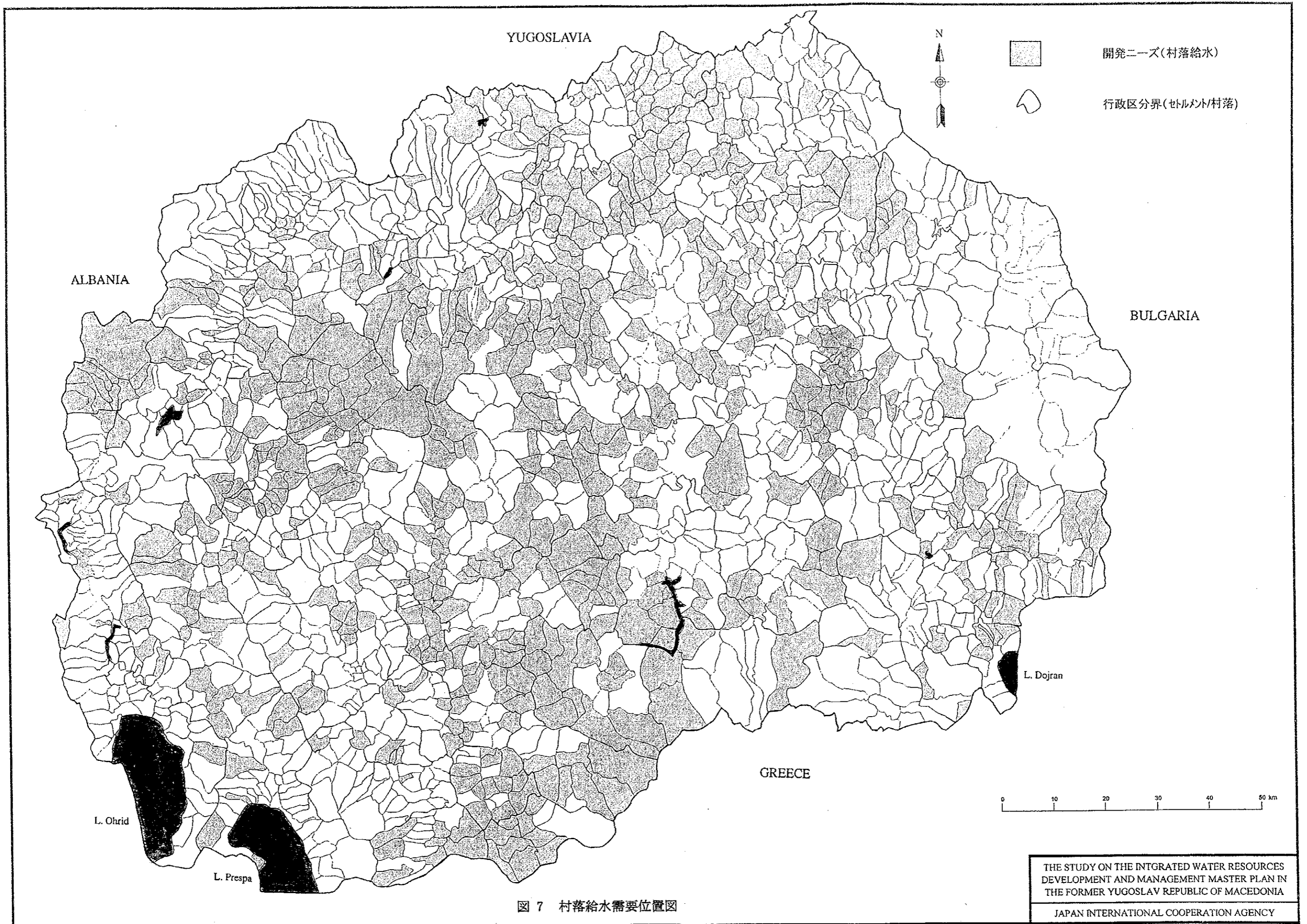
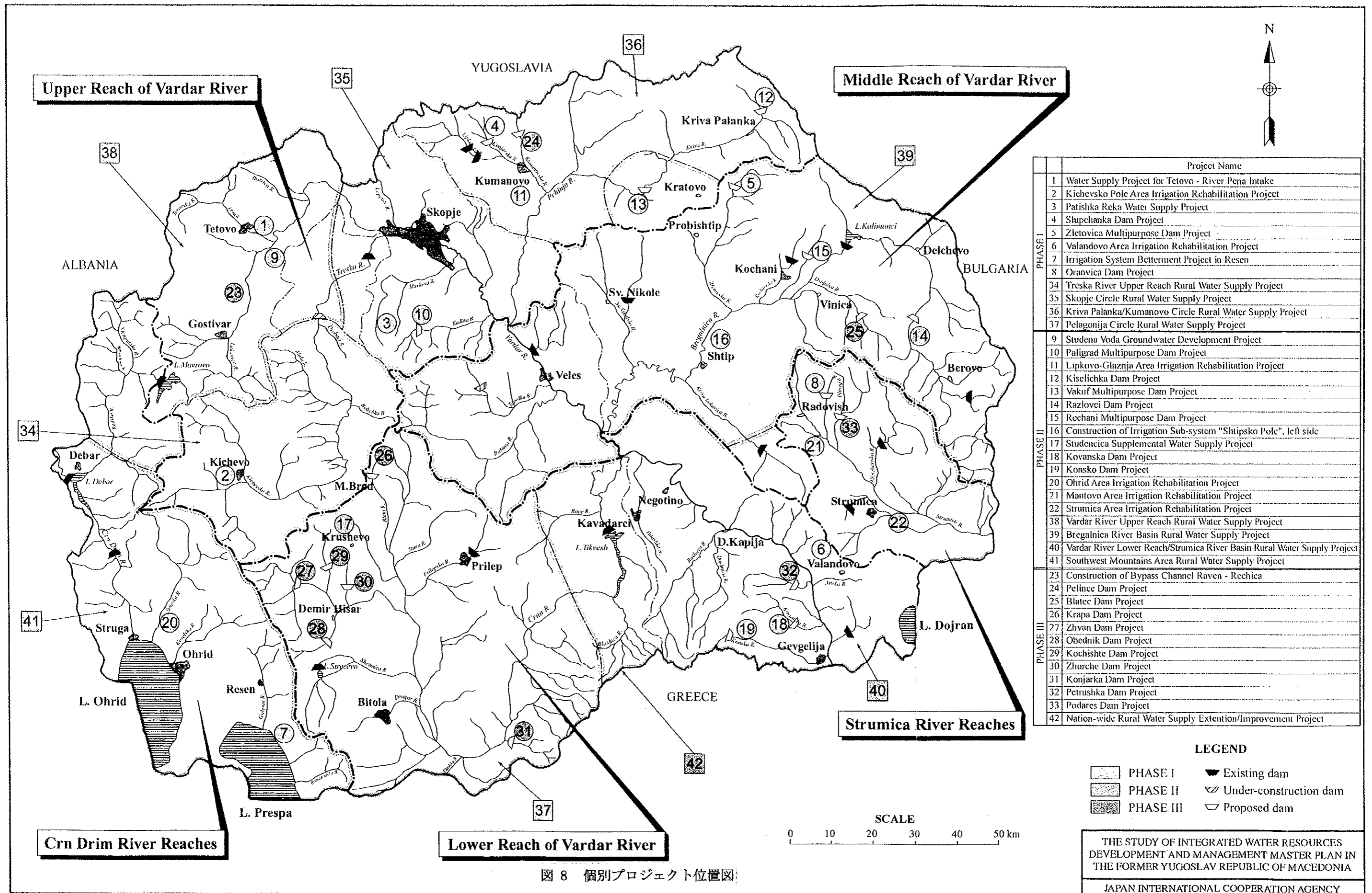


図 7 村落給水需要位置図



| Project Name | |
|--------------|-----------------------------------------------------------------------------|
| PHASE I | 1 Water Supply Project for Tetovo - River Pena Intake |
| PHASE I | 2 Kichevsko Pole Area Irrigation Rehabilitation Project |
| PHASE I | 3 Patishka Reka Water Supply Project |
| PHASE I | 4 Stupchanka Dam Project |
| PHASE I | 5 Zletovica Multipurpose Dam Project |
| PHASE I | 6 Valandovo Area Irrigation Rehabilitation Project |
| PHASE I | 7 Irrigation System Betterment Project in Resen |
| PHASE I | 8 Oraovica Dam Project |
| PHASE I | 34 Treska River Upper Reach Rural Water Supply Project |
| PHASE I | 35 Skopje Circle Rural Water Supply Project |
| PHASE I | 36 Kriva Palanka/Kumanovo Circle Rural Water Supply Project |
| PHASE I | 37 Pelagonija Circle Rural Water Supply Project |
| PHASE II | 9 Studena Voda Groundwater Development Project |
| PHASE II | 10 Pailgrad Multipurpose Dam Project |
| PHASE II | 11 Lipkovo-Glaznja Area Irrigation Rehabilitation Project |
| PHASE II | 12 Kischlika Dam Project |
| PHASE II | 13 Vakuf Multipurpose Dam Project |
| PHASE II | 14 Razloveci Dam Project |
| PHASE II | 15 Rechani Multipurpose Dam Project |
| PHASE II | 16 Construction of Irrigation Sub-system "Shtipko Pole", left side |
| PHASE II | 17 Studencica Supplemental Water Supply Project |
| PHASE II | 18 Kovanska Dam Project |
| PHASE II | 19 Konsko Dam Project |
| PHASE II | 20 Ohrid Area Irrigation Rehabilitation Project |
| PHASE II | 21 Mantovo Area Irrigation Rehabilitation Project |
| PHASE II | 22 Strumica Area Irrigation Rehabilitation Project |
| PHASE II | 38 Vardar River Upper Reach Rural Water Supply Project |
| PHASE II | 39 Bregalnica River Basin Rural Water Supply Project |
| PHASE II | 40 Vardar River Lower Reach/Strumica River Basin Rural Water Supply Project |
| PHASE II | 41 Southwest Mountains Area Rural Water Supply Project |
| PHASE III | 23 Construction of Bypass Channel Raven - Rechica |
| PHASE III | 24 Pelince Dam Project |
| PHASE III | 25 Blatec Dam Project |
| PHASE III | 26 Krapa Dam Project |
| PHASE III | 27 Zhvan Dam Project |
| PHASE III | 28 Obednik Dam Project |
| PHASE III | 29 Kochishte Dam Project |
| PHASE III | 30 Zhurcha Dam Project |
| PHASE III | 31 Konjarka Dam Project |
| PHASE III | 32 Petrushka Dam Project |
| PHASE III | 33 Podares Dam Project |
| PHASE III | 42 Nation-wide Rural Water Supply Extention/Improvement Project |

LEGEND

| | | | |
|--|-----------|--|------------------------|
| | PHASE I | | Existing dam |
| | PHASE II | | Under-construction dam |
| | PHASE III | | Proposed dam |

THE STUDY OF INTEGRATED WATER RESOURCES DEVELOPMENT AND MANAGEMENT MASTER PLAN IN THE FORMER YUGOSLAV REPUBLIC OF MACEDONIA
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図 8 個別プロジェクト位置図

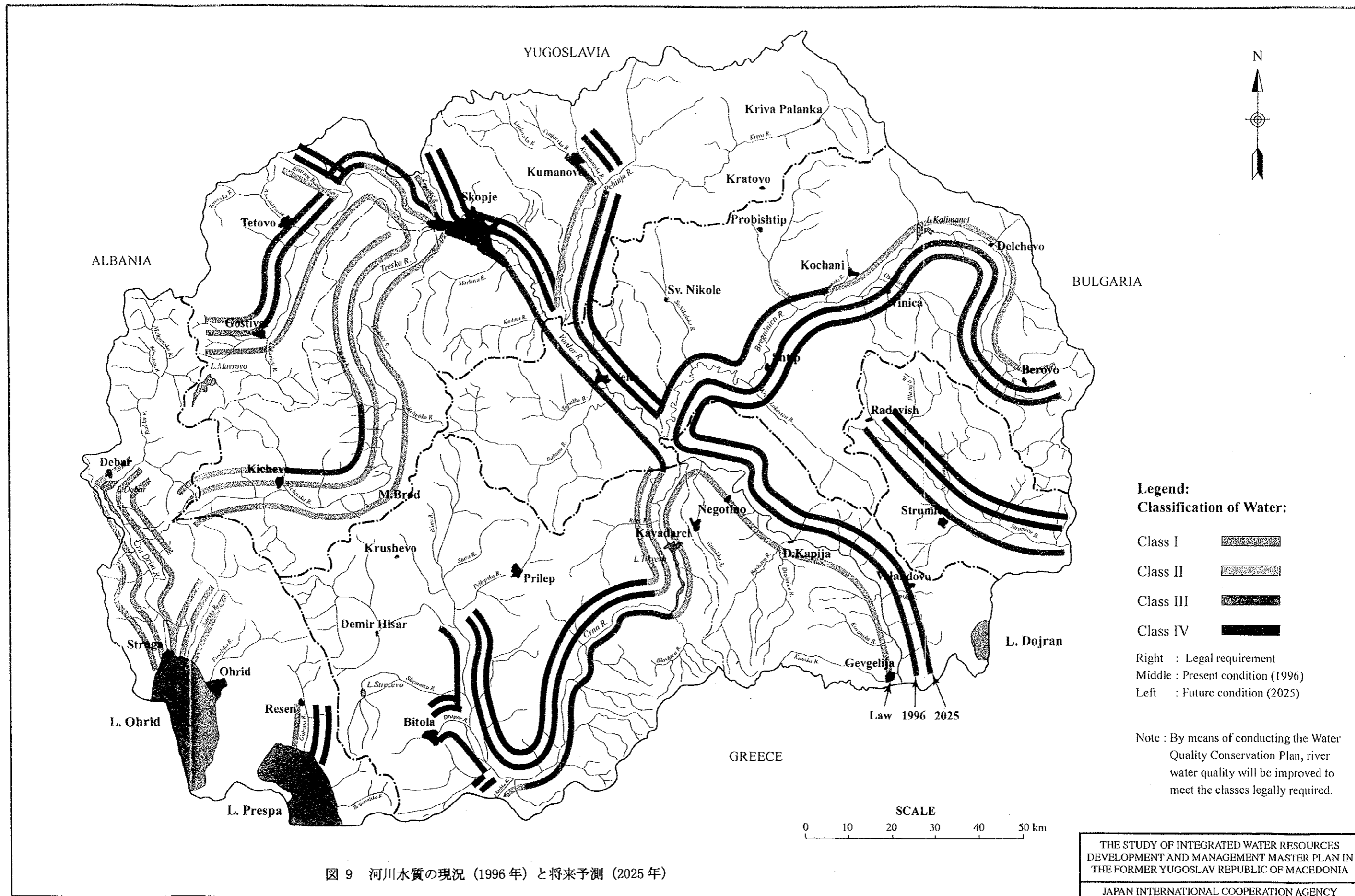


図 9 河川水質の現況 (1996 年) と将来予測 (2025 年)

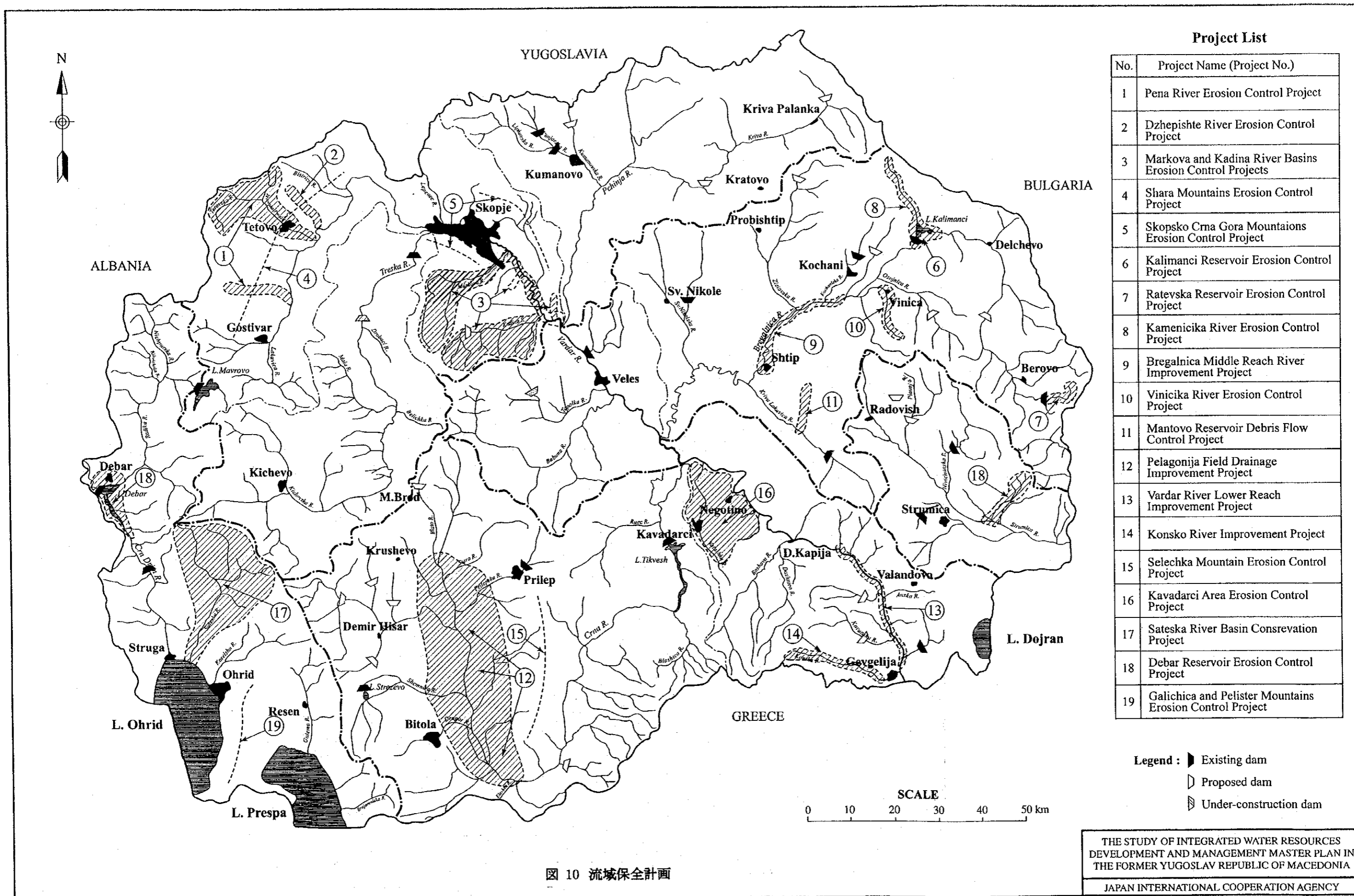


图 10 流域保全計画

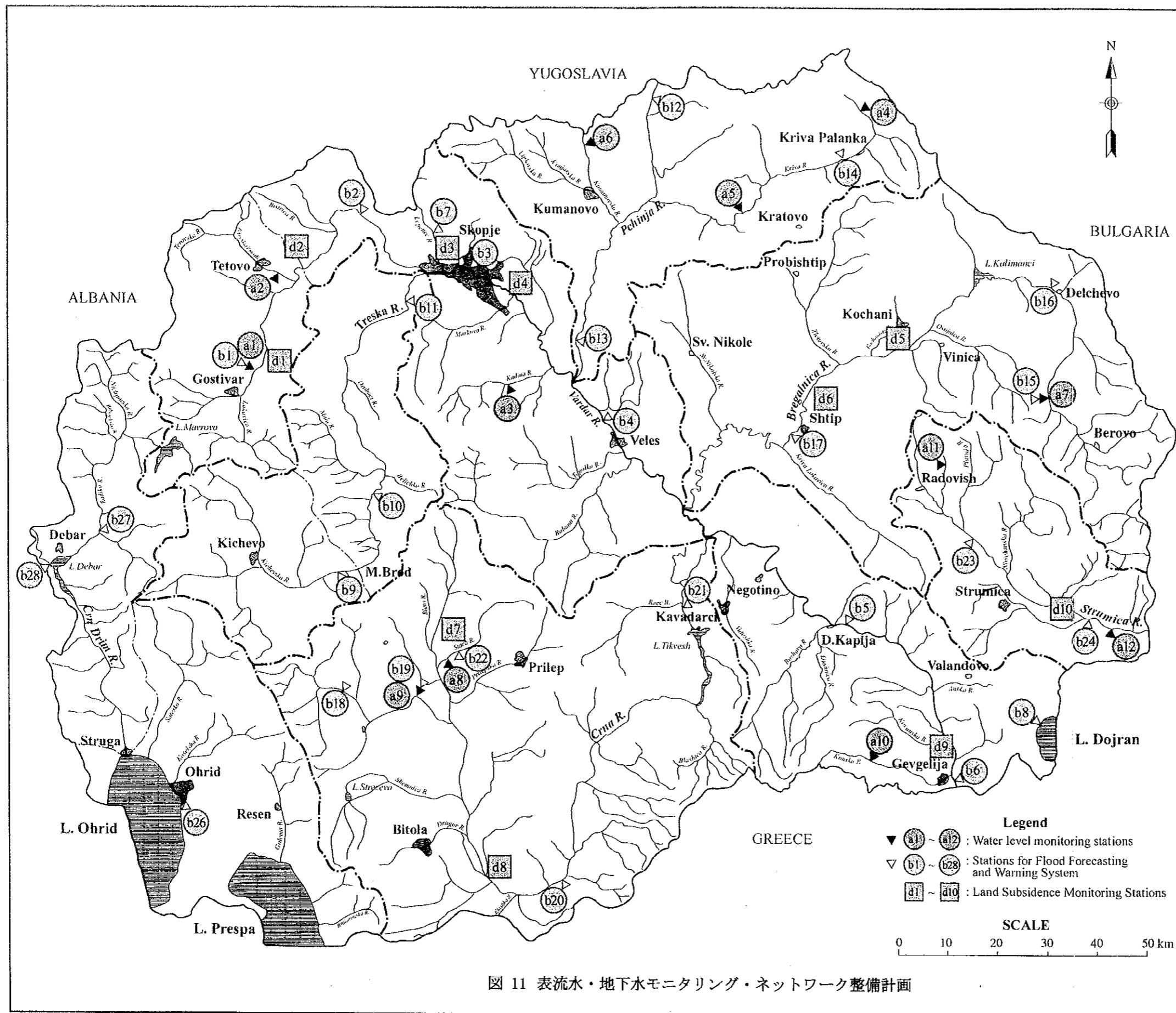


図 11 表流水・地下水モニタリング・ネットワーク整備計画

(a) Water Level Monitoring Network Improvement and Expansion Plan

Renewal of instruments and new installation of limnograph

| No. | Name of Gauging Station | River Name |
|-----|-------------------------|-------------------------------|
| 1 | Balin Dol (existing) | Vardar River mainstream |
| 2 | Pena | Pena River |
| 3 | Paligrad | Kadina River |
| 4 | Kiselichka | Kriva River |
| 5 | Vakuf | Kriva River |
| 6 | Slupchanka | Slupchanska River |
| 7 | Berovo (existing) | Bregalnica River |
| 8 | Bolotino (existing) | Bolotinska River (Crna River) |
| 9 | Bucin (existing) | Crna River |
| 10 | Konsko | Konska River |
| 11 | Oraovica | Oraovica River |
| 12 | Smolarski Most | Strumica River |

(b) Flood Forecasting and Warning System Enhancement

Introducing telemetering system including development of software for prediction of flood discharge

| No. | Name of Gauging Station | River Name |
|-----|-------------------------|-------------------------|
| 1 | Balin Dol | Vardar River mainstream |
| 2 | Radusha | Vardar River mainstream |
| 3 | Skopje | Vardar River mainstream |
| 4 | Veles | Vardar River mainstream |
| 5 | Demir Kapija | Vardar River mainstream |
| 6 | Gevgelija | Vardar River mainstream |
| 7 | Vliv | Lepenec River |
| 8 | Nov Dojran | Lake Dojran |
| 9 | Makedonski Brod | Treska River |
| 10 | Modrishte | Treska River |
| 11 | Sveti Bogorodica | Treska River |
| 12 | Pelince | Pchinja River |
| 13 | Katlanovska Banja | Pchinja River |
| 14 | Kriva Palanka | Pchinja River |
| 15 | Berovo | Bregalnica River |
| 16 | Ochi Pale | Bregalnica River |
| 17 | Shtip | Bregalnica River |
| 18 | Dolenci | Crna River |
| 19 | Buchin | Crna River |
| 20 | Skochivir | Crna River |
| 21 | Vozarci | Crna River |
| 22 | Borotino | Borotinska River |
| 23 | Sushevo | Strumica River |
| 24 | Novo Selo | Strumica River |
| 25 | Stenje | Lake Prespa |
| 26 | Ohrid | Lake Ohrid |
| 27 | Boshkov Most | Radika River |
| 28 | Shpilje | Crn Drim River |

(d) Land Subsidence Monitoring Network Enhancement Plan

Installation of land subsidence monitoring stations

| No. | Name of Station |
|-----|--------------------|
| 1 | Polog (Gostivar) |
| 2 | Polog (Tetovo) |
| 3 | Skopje (West) |
| 4 | Skopje (East) |
| 5 | Kochani |
| 6 | Shtip |
| 7 | Pelagonija (North) |
| 8 | Pelagonija (South) |
| 9 | Gevgelija |
| 10 | Strumica |

Note: Surface water quality monitoring stations and groundwater monitoring stations are excluded from this map.(Ref. Table 8.2)

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| 計画名 | 目的 | 全体事業費(百万米ドル) | | | フェーズ I | | | | | フェーズ II | | | | | フェーズ III | | | | | | | | | | | | | | | | |
|-----------------------------------------|------------|--------------|-------|---------|--------|------|----|----|----|---------|----|----|----|----|----------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| | | I期 | II期 | III期 | 1999 | 2000 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| テトボ水供給計画(ペナ川開発計画) | 上・工水 | 3.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| キチェフスコボレ地区灌漑システム改善計画 | 灌漑リハビリ | 2.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| バティシユカレカ水供給計画 | 上水 | 3.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| スルプチャンカ・ダム開発計画 | 上水 | 7.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ズレトピツァ多目的ダム開発計画(フェーズI) | 上・工水 | 68.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| バランドボ地区灌漑システム改善計画 | 灌漑リハビリ | 7.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| レセン灌漑システム改善計画 | 灌漑リハビリ | 7.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| オラオピツァ・ダム開発計画 | 上水・環境 | 21.7 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| トレスカ川上流域地方給水計画 | 村落給水 | 19.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| スコピエ地方給水計画 | 村落給水 | 21.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| クリバランカ/クマノボ地方給水計画 | 村落給水 | 29.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ペラゴニア地方給水計画 | 村落給水 | 35.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| スツテナボダ地下水開発計画 | 上水 | | 1.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| パリグラッド多目的ダム開発計画 | 上・工水、灌漑、発電 | | 48.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| リブコヴォーグラスニヤ地区灌漑システム改善計画 | 灌漑リハビリ | | 21.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| キセリチカ・ダム開発計画 | 上・工水、灌漑 | | 46.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| バクフ多目的ダム開発計画 | 上・工水、灌漑、発電 | | 164.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ラズロプチ・ダム開発計画 | 上・工水、灌漑 | | 42.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| レチャニ多目的ダム開発計画 | 上・工水、発電 | | 50.3 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| シュティーブスコ・ボレ灌漑サブシステム開発計画 | 灌漑 | | 13.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ストップデンチツァ水源補強計画 | 上・工水 | | 2.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| コバンスカ・ダム開発計画 | 灌漑 | | 31.9 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| コンスコ・ダム開発計画 | 上・工水、灌漑 | | 66.1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| オブリッド地区灌漑システム改善計画 | 灌漑リハビリ | | 8.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| マントヴォ地区灌漑システム改善計画 | 灌漑リハビリ | | 11.2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ストウルミツァ地区灌漑システム改善計画 | 灌漑リハビリ | | 24.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| バルダル川上流域地方給水計画 | 村落給水 | | 15.6 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ブレガルニツァ川流域地方給水計画 | 村落給水 | | 29.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| バルダル川下流域/ストウルミツァ川流域地方給水計画 | 村落給水 | | 21.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 南西山岳部給水計画 | 村落給水 | | 7.5 | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ラベンレチツァ捷水路建設計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ペリンツェ・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ブラテツ・ダム開発計画 | 上・工水、灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| クラバ・ダム開発計画 | 上・工水、灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ジュバン・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| オベドゥニク・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| コチシュテ・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ジュルチェ・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| コニヤルカ・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ベトルシユカ・ダム開発計画 | 灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| ボダレス・ダム開発計画 | 上・工水、灌漑 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 全国地方給水拡張/改善計画 | 村落給水 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 期別合計 | | 226.1 | 606.5 | 662.8 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 水資源開発計画 | | 水資源開発計画合計 | | 1,495.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 水資源管理計画 | | I~III期合計 | | 217.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 水源水質保全計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 流域保全計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 表流水/地下水モニタリングネットワーク整備計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 施設保守運用計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 組織法制度整備計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 人材育成計画 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| マケドニア国によるNew Water Economy Base Plan 立案 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 水資源管理計画合計 | | | | 470.0 | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 総計 | | | | 1,965.4 | | | | | | | | | | | | | | | | | | | | | | | | | | | |

II期プロジェクト実施に関しては、I期の後半にその進捗度や水需給逼迫度等を考慮し具体的な実施計画を策定する。

III期プロジェクト実施に関しては、II期の後半にプロジェクト進捗度や水需給逼迫度等を考慮し具体的な実施計画を策定する。

図 12 事業実施計画(1999年～2025年)

| No. | 計 画 名 | 目的 | 全体事業費 (百万米ドル) | I 期 | | | | | | | | |
|-----|------------------------|---------|------------------|------|------|------|------|------|------|------|------|------|
| | | | | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | | |
| 1 | テトボ水供給計画(ペナ川開発計画) | 上・工水 | 3.2 | | | RE | | | | | | |
| 2 | キチエフスコボレ地区灌漑システム改善計画 | 灌漑/ハベリ | 2.9 | | | | 1.6 | 1.6 | | | | |
| 3 | パティンユカレカ水供給計画 | 上水 | 3.2 | | | RE | | | 1.4 | 1.5 | | |
| 4 | スルプチャンカ・ダム開発計画 | 上水 | 7.3 | | RE | | 1.6 | 1.6 | | | | |
| 5 | ズレトビツア多目的ダム開発計画(フェーズI) | 上・工水 | 68.2 | | RE | 3.7 | 3.6 | | | | | |
| 6 | バランドボ地区灌漑システム改善計画 | 灌漑/ハベリ | 7.3 | | | 13.6 | 20.5 | 20.5 | 13.6 | | | |
| 7 | レセン灌漑システム改善計画 | 灌漑/ハベリ | 7.0 | | RE | | | | | | | |
| 8 | オラオビツア・ダム開発計画 | 上水、環境用水 | 21.7 | | | 3.5 | 3.5 | | | | | |
| 34 | トレスカ川上流域地方給水計画 | 小 計 | 120.8 | 0.0 | 0.0 | 20.8 | 30.8 | 33.9 | 26.5 | 8.8 | 6.5 | 8.7 |
| 35 | スコピエ地方給水計画 | 村落給水 | 19.3 | | | | | NP | | | | |
| 36 | クリバランカ/クマノボ地方給水計画 | 村落給水 | 21.3 | | | NP | | | | | | |
| 37 | ペラゴニア地方給水計画 | 村落給水 | 29.3 | | | NP | 10.6 | 10.7 | | | | |
| | | 小 計 | 105.3 | 0.0 | 0.0 | 0.0 | 19.4 | 34.1 | 31.1 | 11.0 | 11.7 | 12.7 |
| | | 合 計 | 226.1 | 0.0 | 0.0 | 20.8 | 50.2 | 68.0 | 57.6 | 29.5 | 9.6 | 9.7 |

備考: RE: 既存スタディ(F/S、基本設計、詳細設計等)の見直し、更新 NP: 新規計画の立案および調査

図13 事業実施計画(I期:1999年~2005年)

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